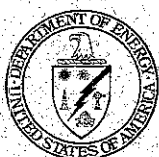


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DOE/RL-2005-84  
Rev. 0

# Engineering Evaluation/ Cost Analysis #2 for the 300 Area

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# **Engineering Evaluation/ Cost Analysis #2 for the 300 Area**

February 2006



**United States Department of Energy**

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P.O. Box 550, Richland, Washington 99352

## EXECUTIVE SUMMARY

This document presents the results of an evaluation of three removal action alternatives for the disposition of the 324 and 327 Buildings in the 300 Area of the Hanford Site. These alternatives also address disposition of the ancillary facilities associated with the 324 and 327 Buildings. These buildings have been grouped together because they are similar in size, complexity, and availability. The U.S. Department of Energy, Richland Operations Office has determined that the facilities have no further use. The potential threat of release of hazardous substances in the facilities poses a substantial risk to human health and the environment and, therefore, justifies use of *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) removal action authority in accordance with Section 300.415 (b)(2) of the "National Oil and Hazardous Substances Pollution Contingency Plan." An action memorandum will be developed from this engineering evaluation/cost analysis (EE/CA) to document and authorize implementation of the removal action that is selected for the facilities.

This is the second EE/CA prepared for disposition of facilities in the 300 Area. The *Engineering Evaluation/Cost Analysis #1 for the 300 Area* (EE/CA #1) (DOE-RL 2004) addressed 82 facilities in the northern portion of the 300 Area. EE/CA #1 recommended facility deactivation and decontamination, followed by decommissioning and demolition. The recommendation was approved in an action memorandum (EPA 2005) signed by the U.S. Environmental Protection Agency and the U.S. Department of Energy. The *Removal Action Work Plan #1 for Facilities, 300 Area* (DOE-RL 2005a) was subsequently prepared to establish methods and activities to complete facility decommissioning and demolition, to remediate contaminated soils, and to manage and dispose of resulting wastes. Activities specified in the removal action work plan (DOE-RL 2005a) are currently under way.

This document (EE/CA #2) briefly describes the 324 and 327 Buildings and ancillary facilities, the site conditions, and the sources and extent of contamination to provide a framework for the discussion of removal action objectives and alternatives. Finally, each removal action alternative is compared against the criteria of effectiveness, implementability, and cost.

Removal actions evaluated for the 324 and 327 Buildings include (1) no action; (2) deactivation, decontamination, decommissioning, and demolition (D4); and (3) surveillance and maintenance (S&M) followed by deactivation and decontamination, and facility decommissioning and demolition. The no action alternative assumes that all short-term and long-term maintenance of the facilities is terminated and that the facilities are locked to prevent entry. The D4 alternative consists of deactivation (closure) and decontamination (contamination removal) of the facilities, followed by decommissioning (shut off utilities) and demolition (destroy) and associated waste disposal of the contaminated debris. The S&M alternative includes a period of facility monitoring followed by D4 of the facilities.

The no action alternative would not eliminate, reduce, or control risks to human health and the environment. Because implementation of this alternative would not meet removal action objectives or the threshold criterion for overall protectiveness, and would not support remedial activities on the 300-FF-2 waste sites, it cannot be considered a viable alternative. The S&M alternative would delay the start of D4 by 5 years and would meet the requirements of *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003) Milestone M-94-00. However, the alternative would require modifications to existing Tri-Party Agreement Milestones M-89-00 and M-94-03, which call for closure of the unpermitted storage unit and complete disposition of the 324 Building, respectively.

Non-discounted and present-worth cost estimates for the three alternatives are shown in Table ES-1. The costs are based on present-day (2005) dollars. Consistent with guidance established by the U.S. Environmental Protection Agency and the U.S. Office of Management and Budget, present-worth analysis is included as a basis for comparing the costs of cleanup alternatives under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* program (EPA 1993).

**Table ES-1. Cost Comparison for Removal Action Alternatives  
for the 324 and 327 Buildings.**

Alternative	Present-Worth Cost
Alternative 1 – No action	No cost
Alternative 2 – Deactivation, decontamination, decommissioning, and demolition	\$59,914,000
Alternative 3 – Long-term surveillance and maintenance followed by facility deactivation, decontamination, decommissioning, and demolition.	\$81,227,000

The recommended removal action alternative for the 324 and 327 Buildings is Alternative 2, facility deactivation and decontamination, followed by decommissioning and demolition. This alternative is recommended based on its overall ability to protect human health and the environment and its effectiveness in maintaining protection for both the short term and the long term. The alternative would also reduce the potential for a release by reducing the inventory of contaminants. This alternative provides the best balance of protecting human health and the environment, protecting workers, meeting the removal action objectives, achieving cost effectiveness, and providing an end state that is consistent with future cleanup actions and commitments to the Tri-Party Agreement (Ecology et al. 2003).



## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>1-1</b>
1.1	PURPOSE AND SCOPE.....	1-1
1.2	BACKGROUND .....	1-1
1.2.1	Groundwater Cleanup .....	1-2
1.2.2	Soil Cleanup.....	1-2
1.2.3	Facility Structures .....	1-3
1.3	REMOVAL ACTION AUTHORITY .....	1-4
1.3.1	Resource Conservation and Recovery Act of 1976 .....	1-5
1.3.2	300-FF-2 Operable Unit Remedial Action .....	1-5
1.3.3	National Environmental Policy Act of 1969.....	1-6
1.4	SCHEDULE DRIVERS.....	1-6
<b>2.0</b>	<b>SITE CHARACTERIZATION .....</b>	<b>2-1</b>
2.1	BACKGROUND AND SITE DESCRIPTION .....	2-1
2.1.1	General Description of the Hanford Site 300 Area.....	2-1
2.1.2	Land-Use Access and Potential Reuse.....	2-1
2.1.3	Flora and Fauna.....	2-4
2.1.4	Cultural Resources .....	2-4
2.2	FACILITY DESCRIPTION .....	2-5
2.2.1	324 Waste Technology Engineering Laboratory and Associated Structures.....	2-5
2.2.2	327 Post-Irradiation Test Laboratory and Associated Structures .....	2-6
2.2.3	300-FF-2 Operating Unit Waste Sites.....	2-7
2.3	SOURCE, NATURE, AND EXTENT OF CONTAMINATION .....	2-8
2.4	RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION.....	2-9
<b>3.0</b>	<b>REMOVAL ACTION OBJECTIVES .....</b>	<b>3-1</b>
<b>4.0</b>	<b>IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES .....</b>	<b>4-1</b>
4.1	ALTERNATIVE 1 – NO ACTION.....	4-1

4.2	ALTERNATIVE 2 – DEACTIVATION AND DECONTAMINATION FOLLOWED BY DECOMMISSIONING AND DEMOLITION (D4).....	4-1
4.2.1	Deactivation and Decontamination.....	4-2
4.2.2	Decommissioning and Demolition .....	4-3
4.2.3	Residual Contamination.....	4-4
4.2.4	Cost.....	4-5
4.3	ALTERNATIVE 3 – SURVEILLANCE AND MAINTENANCE (FOLLOWED BY D4) .....	4-5
4.4	COMMON ELEMENTS .....	4-7
4.4.1	Historical Properties Management.....	4-7
4.4.2	Waste Management.....	4-7
5.0	ANALYSIS OF REMOVAL ACTION ALTERNATIVES .....	5-1
5.1	EFFECTIVENESS.....	5-1
5.1.1	Overall Protection of Human Health and the Environment.....	5-1
5.1.2	Compliance with Applicable or Relevant and Appropriate Requirements .....	5-2
5.1.3	Long-Term Effectiveness and Permanence .....	5-2
5.1.4	Reduction of Toxicity, Mobility, or Volume Through Treatment.....	5-3
5.1.5	Short-Term Effectiveness .....	5-3
5.2	IMPLEMENTABILITY .....	5-4
5.3	COST .....	5-5
5.4	OTHER CONSIDERATIONS.....	5-5
5.4.1	Transportation Impacts .....	5-6
5.4.2	Air Quality .....	5-6
5.4.3	Natural, Cultural, and Historical Resources .....	5-7
5.4.4	Noise, Visual, and Aesthetic Effects.....	5-8
5.4.5	Socioeconomic Impacts .....	5-8
5.4.6	Environmental Justice.....	5-8
5.4.7	Irreversible and Irretrievable Commitment of Resources.....	5-8
5.4.8	Cumulative Impacts .....	5-9
6.0	RECOMMENDED ALTERNATIVE .....	6-1
7.0	SCHEDULE.....	7-1
8.0	REFERENCES.....	8-1

# Table of Contents

---

## APPENDIX

A	APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS .....	A-i
---	---	-----

## FIGURES

1-1.	Hanford Site Map .....	1-7
1-2.	Hanford Site 300 Area Operable Units. ....	1-8
1-3.	324 Complex and Underlying Waste Sites. ....	1-9
1-4.	327 Complex and Underlying Waste Sites. ....	1-10
7-1.	Proposed 324/327 Facilities D4 Schedule (Calendar Year).....	7-2

## TABLES

1-1.	Summary of Facilities in the Scope of Engineering Evaluation/Cost Analysis #2.....	1-11
1-2.	Summary of 300-FF-2 Operable Unit Waste Sites Within the Engineering Evaluation/Cost Analysis #2 Geographical Area.....	1-12
1-3.	Summary of Tri-Party Agreement Milestones Relevant to the 300 Area.....	1-12
4-1.	Deactivation/Decontamination and Decommissioning Cost Summary. ....	4-8
4-2.	Surveillance and Maintenance and Deactivation/Decontamination and Decommissioning Cost Summary. ....	4-9
5-1.	Summary of Evaluation Criteria. ....	5-10



## ACRONYMS

ACP	300 Area Accelerated Closure Plan
ARAR	applicable or relevant and appropriate requirement
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFR	<i>Code of Federal Regulations</i>
COC	contaminant of concern
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant difference
FR	<i>Federal Register</i>
HEPA	high-efficiency particulate air
NEPA	<i>National Environmental Policy Act of 1969</i>
NHPA	<i>National Historic Preservation Act of 1966</i>
NPL	National Priorities List
OU	operable unit
PCB	polychlorinated biphenyl
R&D	research and development
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCW	<i>Revised Code of Washington</i>
REC	radiochemical engineering cells
RL	U.S. Department of Energy, Richland Operations Office
RTD	remove, treat, and dispose
ROD	Record of Decision
S&M	surveillance and maintenance
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
TSD	treatment, storage, and disposal unit
WAC	<i>Washington Administrative Code</i>
WIDS	Waste Information Data System



**METRIC CONVERSION CHART**

<b>Into Metric Units</b>			<b>Out of Metric Units</b>		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
<b>Length</b>			<b>Length</b>		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
<b>Area</b>			<b>Area</b>		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
<b>Mass (weight)</b>			<b>Mass (weight)</b>		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
<b>Volume</b>			<b>Volume</b>		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
<b>Temperature</b>			<b>Temperature</b>		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
<b>Radioactivity</b>			<b>Radioactivity</b>		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries



## 1.0 INTRODUCTION

### 1.1 PURPOSE AND SCOPE

This document presents the results of an engineering evaluation/cost analysis (EE/CA) that was conducted to evaluate alternatives and recommend an approach for disposition of the 324 Building, the 327 Building, and ancillary facilities (subsequently referred to as facilities<sup>1</sup>) located in the 300 Area of the Hanford Site. The U.S. Department of Energy (DOE), Richland Operations Office (RL) has determined that the potential threat of release of hazardous substances<sup>2</sup> in these facilities (listed in Table 1-1) poses a substantial risk to human health and the environment to the extent that a removal action<sup>3</sup> is warranted. These facilities were grouped together due to their size, the fact that they have similar contaminants, their complexity, and availability (i.e., inactive status). An action memorandum that will be developed from this EE/CA will document and authorize implementation of the removal action selected for the facilities.

The evaluation includes building contents, above-ground structures (e.g., walls and roof), on-grade floor slabs, and the below-grade foundations of the inactive facilities. The deeper subsurface structures and soil contamination associated with the facilities are generally excluded from this evaluation and are deferred to the 300-FF-2 Operable Unit (OU) remedial action program.

### 1.2 BACKGROUND

The Hanford Site is a 1,517-km<sup>2</sup> (586-mi<sup>2</sup>) Federal facility located in southeastern Washington State along the Columbia River (Figure 1-1) and is operated by RL. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. The 300 Area was constructed and operated as a reactor fuel fabrication and laboratory complex. Past operations, disposal practices, spills, and unplanned releases have resulted in contamination of the facility structures, underlying soil, and underlying groundwater in the 300 Area. Consequently, in November 1989, the 300 Area was one of four areas of the Hanford Site that

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<sup>1</sup> The term "facility" is used in a generic way to encompass all the structures, buildings, piping, ducting, etc., associated with the buildings listed in Table 1-1.

<sup>2</sup> "Hazardous substances" refers to those substances defined by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), Section 101(14), and include both radioactive and chemical substances.

<sup>3</sup> "Remove" or "removal," as defined by CERCLA, Section 101(23), refers to the cleanup or removal of released hazardous substances from the environment; actions if a threat of release of hazardous substances occur; actions to monitor, assess, and evaluate the release (or threat of release) of hazardous substances; the disposal of removed material; or other actions that may be necessary to prevent, minimize, or mitigate damage to public health or welfare or to the environment, which may otherwise result from a release or threat of release. If a planning period of at least 6 months exists before onsite actions must be initiated, the removal action is considered non-time-critical and an EE/CA is conducted.

## Introduction

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were placed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

The 300 Area NPL site is subdivided into three OUs to address cleanup of the soil and groundwater contamination that resulted from past operations (Figure 1-2). The 300-FF-1 and the 300-FF-2 OUs address contamination at liquid disposal sites, burial grounds, and soil waste sites. The 300-FF-5 OU addresses groundwater contamination beneath the burial grounds and soil waste sites located within the geographical boundary of the 300 Area NPL site. Geographically, the facilities that supported the fuels fabrication processes and research and development (R&D) activities in the 300 Area (subsequently referred to as the 300 Area Complex) are co-located with the 300-FF-2 OU waste sites. The scope and role of CERCLA cleanup actions to address groundwater contamination, soil contamination, and facility structures at the 300 Area Complex is summarized in the following subsections.

### 1.2.1 Groundwater Cleanup

The 300-FF-5 OU addresses groundwater contamination beneath the burial grounds and soil waste sites located within the geographical boundary of the 300 Area NPL site in accordance with the interim action Record of Decision (ROD) that was issued in 1996 (EPA et al. 1996). An explanation of significant difference (ESD) (EPA et al. 2000) was issued in 2000 to expand the 300-FF-5 OU to cover all of the groundwater that underlies the 300 Area waste sites and burial grounds. This includes the groundwater beneath the outlying 300-FF-2 source sites and burial grounds.

Uranium is the primary contaminant of concern (COC) in the 300-FF-5 OU. Other 300-FF-5 COCs include trichloroethene, dichloroethene, and tritium. Based on information that was available at the time that the interim action ROD (EPA et al. 1996) was developed, continued groundwater monitoring and institutional controls was the selected interim remedy to ensure that contaminant concentrations were decreasing and to prevent groundwater use. A 5-year review of the selected remedy effectiveness was completed in 2001 as required by CERCLA. Results of the review supported a conclusion that, with some modifications to the 300-FF-5 OU groundwater monitoring plan, the selected remedy of continued monitoring and institutional controls was still appropriate. At the present time, the interim remedy is being re-evaluated because uranium concentrations in the groundwater have not decreased as expected. The *Work Plan for Phase III Feasibility Study 300-FF-5 Operable Unit* (DOE-RL 2005b) describes the methodology that will be used to re-evaluate the remedy for the 300-FF-5 OU.

### 1.2.2 Soil Cleanup

An interim action ROD authorizing cleanup of the 300-FF-2 OU waste sites was issued in April 2001 (EPA et al. 2001). In accordance with an industrial land-use scenario, the selected remedy specified by the interim action ROD (EPA et al. 2001) is removal of contaminated soil and debris, treatment (as necessary to meet disposal facility acceptance criteria), and disposal. This remedy is commonly referred to as "remove, treat, and dispose" (RTD). In the context of

## Introduction

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the 300 Area Complex, the scope of the 300-FF-2 OU interim action ROD (EPA et al. 2001) consists of waste sites (including one general-content burial ground) that require excavation or "action" in accordance with the RTD selected remedy and sites that are currently defined as "candidate sites."<sup>4</sup> Excavation may be required at the candidate sites identified in the 300-FF-2 OU interim action ROD if supplemental characterization data show that remedial actions are warranted based on risk posed to human health or the environment. Although many of the 300 Area Complex facilities overlie and prevent access to 300-FF-2 OU waste sites that must be excavated, the facilities are excluded from the scope of the interim action ROD (EPA et al. 2001). However, the interim action ROD did require development of an implementation plan to include commitments regarding removal of facilities and above-ground structures in order to facilitate remediation of underlying waste sites. The current *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003) milestones for cleanup of the 300-FF-2 OU waste sites are presented in Table 1-3.

### 1.2.3 Facility Structures

At the beginning of calendar year 2006, approximately 200 facilities were located within the 300 Area Complex. Some of these facilities are empty or undergoing demolition, while others are still actively used to support ongoing research activities and laboratory operations in the 300 Area Complex. Before the 300-FF-2 OU selected remedy can be implemented, existing facility operations must be terminated or relocated; and deactivation, decontamination, decommissioning, and demolition (D4) and removal of the associated buildings must be completed to obtain access to underlying and/or adjacent contaminated waste sites. Cleared geographical areas are also required for staging areas to support future remedial action operations. In addition to the need for facility removal to support implementation of 300-FF-2 OU remedial actions, years of reactor fuel fabrication and laboratory operations in the 300 Area Complex left the associated facilities contaminated. Facilities will be vacated in a timeframe supporting completion of Tri-Party Agreement Milestone M-94-00 by September 30, 2015. A potential threat of release of hazardous substances in the facilities poses substantial risk to human health and the environment to the extent that a removal action is warranted for the facilities.

The *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* (DOE and EPA 1995) is a joint policy between DOE and EPA that allows use of the CERCLA removal action process (40 *Code of Federal Regulations* [CFR] 300.415) for deactivation, decontamination, and demolition activities. To qualify for the inclusion in the removal action process, the facilities must contain hazardous substances that, if released, would pose a substantial risk. The non-time-critical removal action process also requires preparation of an EE/CA to identify and evaluate different alternatives for proposed removal actions.

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<sup>4</sup> The geographic area defined by the 300-FF-2 OU waste sites extends beyond the 300 Area Complex. The waste sites and candidate sites located in the 300 Area Complex are a subset of the total number of sites identified in the 300-FF-2 OU interim action ROD (EPA et al. 2001).

## Introduction

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The *Engineering Evaluation/Cost Analysis #1 for the 300 Area* (EE/CA #1) (DOE-RL 2004) was issued by the DOE in 2004 to address 82 facilities located in the northern portion of the 300 Area. EE/CA #1 recommended facility deactivation, followed by decontamination and demolition. The recommendation was approved in an action memorandum (EPA 2005) signed by EPA and DOE.

This EE/CA addresses the 324 and 327 Buildings and associated ancillary facilities (Figures 1-3 and 1-4, respectively), which are the second group of facilities that will be removed to mitigate potential risks to human health and the environment and to allow for the later remediation of the underlying 300-FF-2 OU waste sites. An action memorandum developed from this EE/CA will document and authorize implementation of the remedy that is selected for the facilities included in this removal action. To meet the Tri-Party Agreement milestones (Table 1-3) for completing 300-FF-2 OU remedial actions, removal of the overlying and/or adjacent 300 Area Complex facilities must occur before soil remediation activities can begin.

### 1.3 REMOVAL ACTION AUTHORITY

This EE/CA was prepared in accordance with CERCLA and 40 CFR 300.415 to satisfy the environmental review requirements for non-time-critical removal actions and to provide a framework to evaluate and select alternative approaches for disposition of the identified 300 Area Complex facilities. This EE/CA also specifies actions designed to comply with requirements of the DOE and EPA joint policy (DOE and EPA 1995) and the Tri-Party Agreement (Ecology et al. 2003). The EPA, Washington State Department of Ecology (Ecology), and DOE (referred to as the Tri-Parties) have determined that the facilities included in the scope of this EE/CA qualify for the removal action process based on the potential threat of release of hazardous substances that pose a risk to human health and the environment. After the public has had an opportunity to comment on the alternatives and the recommended approach presented in this document, the Tri-Parties will select the most appropriate removal action for the facilities. As the lead regulatory agency, EPA will prepare an action memorandum (a CERCLA decision document) to reflect the decisions made by the Tri-Parties.

This proposed removal action presents several integration issues that impact disposition of the 324 and 327 Facilities, including the *Resource Conservation and Recovery Act of 1976* (RCRA)<sup>5</sup>, 300-FF-2 OU remedial actions, and the *National Environmental Policy Act of 1969* (NEPA), as summarized in the following subsections.

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<sup>5</sup> The EPA has delegated authority to implement much of the RCRA program, including operation and closure of treatment, storage, and disposal (TSD) units, to the State of Washington. The state exercises this authority via the "Hazardous Waste Management Act" (*Revised Code of Washington* [RCW] 70.105), which is implemented by *Washington Administrative Code* (WAC) 173-303 under the regulatory lead of Ecology.

## Introduction

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### 1.3.1 Resource Conservation and Recovery Act of 1976

The scope of this EE/CA includes performing closure of an unpermitted RCRA storage unit in the 324 Building. The 324 Building was constructed in the 1960s to support materials and chemical process R&D activities ranging from laboratory/bench-scale studies to full engineering-scale pilot-plant demonstrations. In the mid-1990s it was determined that dangerous waste and waste residues were being stored for greater than 90 days in the 324 Building radiochemical engineering cells (REC) and the high-level vault/low-level vault tanks.

Through Tri-Party Agreement Milestone M-89-00 (Ecology et al. 2003), an agreement was reached to close the unpermitted RCRA unit in the 324 Building. The REC closure will be performed in satisfaction of the closure requirements of WAC 173-303-610, based on work to be performed pursuant to CERCLA requirements. This approach provided for effective integration of RCRA and CERCLA requirements that apply to the 324 Building. Ecology will maintain regulatory oversight of the closure, while EPA will maintain lead regulatory authority for the scope of this removal action.

### 1.3.2 300-FF-2 Operable Unit Remedial Action

As previously discussed, many of the facilities in the 300 Area Complex prevent access to 300-FF-2 OU waste sites and must undergo D4 before the RTD remedy can be implemented in accordance with the 300-FF-2 OU interim action ROD (EPA et al. 2001). The specific 300-FF-2 OU action sites and candidate sites that lie beneath and/or adjacent to the facilities included in the scope of this EE/CA are identified in Table 1-2 of this document. In addition, facilities in the scope of this EE/CA may be impacted by the RTD remedy based on a need for cleared geographical areas to support excavation operations. In accordance with the interim action ROD (EPA et al. 2001), most of the excavated soil and waste debris will be transported to the Environmental Restoration Disposal Facility (ERDF). Materials that can be effectively decontaminated and uncontaminated waste that can be effectively segregated from contaminated waste would be recycled or sent to an approved offsite facility (e.g., RCRA Subtitle D sanitary landfill) for disposal. To maintain safe and efficient operations, cleared areas are required in close proximity to the waste sites to stockpile excavated material, stage waste transport containers, establish haul roads, and set up temporary construction offices.

One of the components of the RTD remedy for the 300-FF-2 OU waste sites is a requirement to maintain and/or implement institutional controls during remedial action activities and after cleanup is complete. The institutional controls will be consistent with the industrial exposure scenario for the majority of the 300-FF-2 waste sites and with the unrestricted use exposure scenario for the eight outlying waste<sup>6</sup> sites (EPA et al. 2004). The objectives for institutional controls are fully described in the 300-FF-2 OU interim action ROD (EPA et al. 2001) and include measures to control and/or restrict site access, land use, infiltration and irrigation, and groundwater use. Disposition of the facilities included in the scope of this EE/CA requires

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<sup>6</sup> The eight outlying waste sites are 618-10, 316-4, 600-63, 600-259, 618-7, 300 VTS, 618-13, and 600-47. None of the facilities in the scope of this EE/CA are in the unrestricted use areas.

## Introduction

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integration with 300-FF-2 OU remedial actions to ensure that appropriate institutional controls are maintained in the 300 Area Complex.

### 1.3.3 National Environmental Policy Act of 1969

In accordance with the *Secretarial Policy on the National Environmental Policy Act* (DOE 1994) and DOE O 451.1B, NEPA values have been incorporated into this EE/CA. The policy statement and DOE order encourage integration of NEPA values into CERCLA documents (e.g., this EE/CA) to the extent practicable rather than requiring separate documentation. A discussion of NEPA values is included in Section 5.0 of this document.

## 1.4 SCHEDULE DRIVERS

In 1989, the Tri-Party Agreement established a procedural framework and schedule for cleanup actions at the Hanford Site. Tri-Party Agreement Milestone M-016-00B requires interim completion of all 300 Area remedial actions by September 30, 2018. Tri-Party Agreement Milestone M-16-69 requires completion of all interim remedial actions defined in the 300-FF-2 interim action ROD (EPA et al. 2001) by September 30, 2015. Tri-Party Agreement Milestone M-094-00 requires complete disposition (completion of removal activities) of 300 Area facilities by September 30, 2015. The current Tri-Party Agreement Milestone M-94-03 requires complete disposition of the 324 and 327 Buildings by September 30, 2010. Additionally, Tri-Party Agreement M-89-00 requires final closure of the 324 Building hot cells by September 2010<sup>7</sup>, to coincide with the Tri-Party Agreement Milestone M-94-03. All Tri-Party Agreement milestones that directly or indirectly impact disposition of the facilities included in the scope of this EE/CA are summarized in Table 1-3.

Another schedule driver is a CERCLA statutory requirement to initiate and maintain substantial continuous remedial actions at a NPL site within 15 months of obtaining a ROD. For the 300 Area NPL site, remedial actions at the 300-FF-1 OU and groundwater monitoring activities were initiated in 1997. Remedial actions and waste shipments for 300-FF-1 were completed in 2003, and backfilling of all sites was completed in early 2004. The focus for continuous remedial actions has transitioned to the 300-FF-2 OU waste sites. Disposition of facilities in the 300 Area Complex will contribute to support of the continuous physical progress requirement for the 300 Area NPL site and provide access to underlying waste sites for implementation of remedial actions in accordance with the 300-FF-2 OU interim action ROD (EPA et al. 2001).

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<sup>7</sup> This document was written with the assumption that the Tri-Party Agreement Change Request for Milestone M-89-00 would be approved. Approval of the change would provide for consistent completion dates for disposition of the 324 Building and closure of the REC.

Figure 1-1. Hanford Site Map.

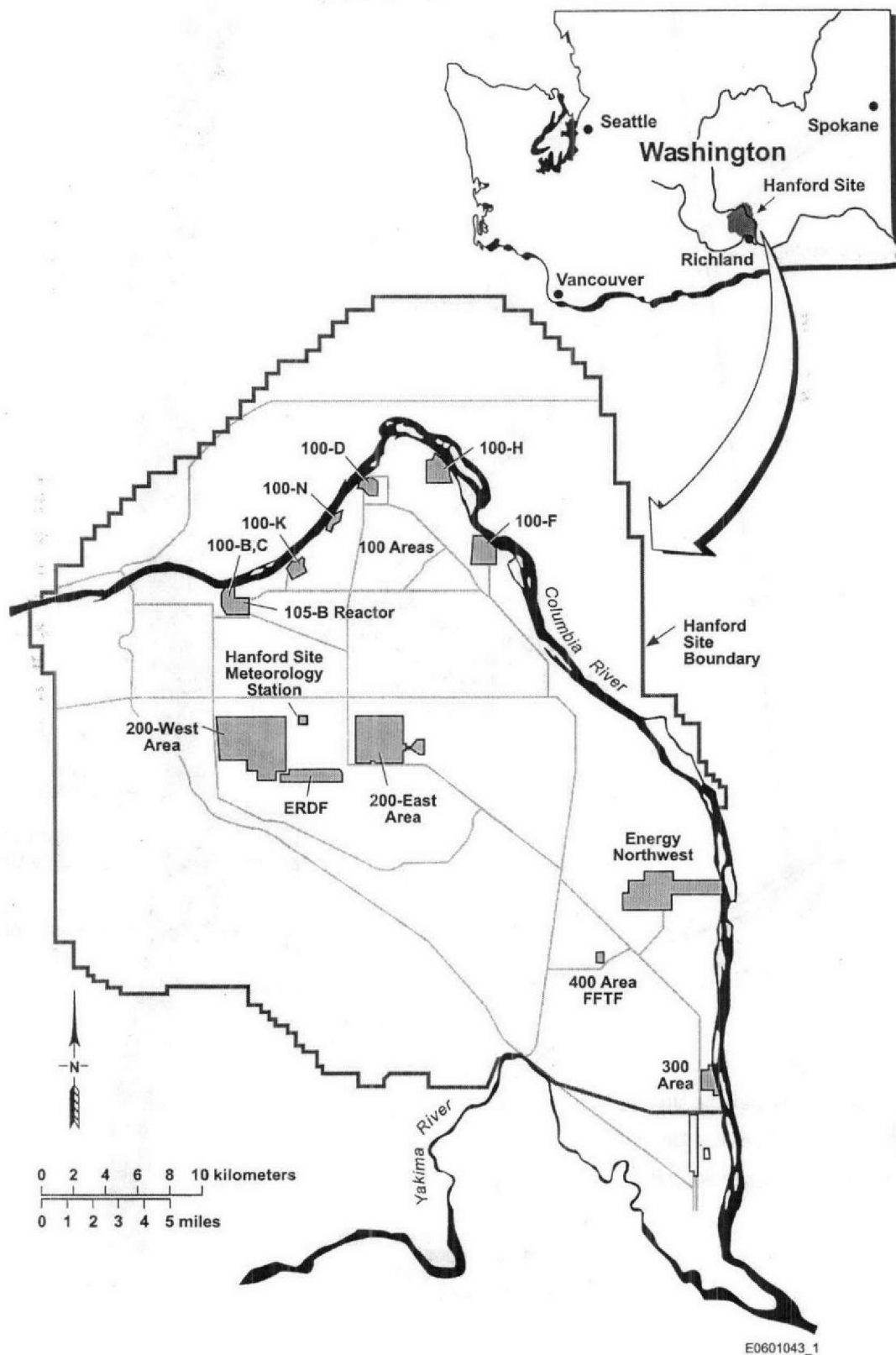
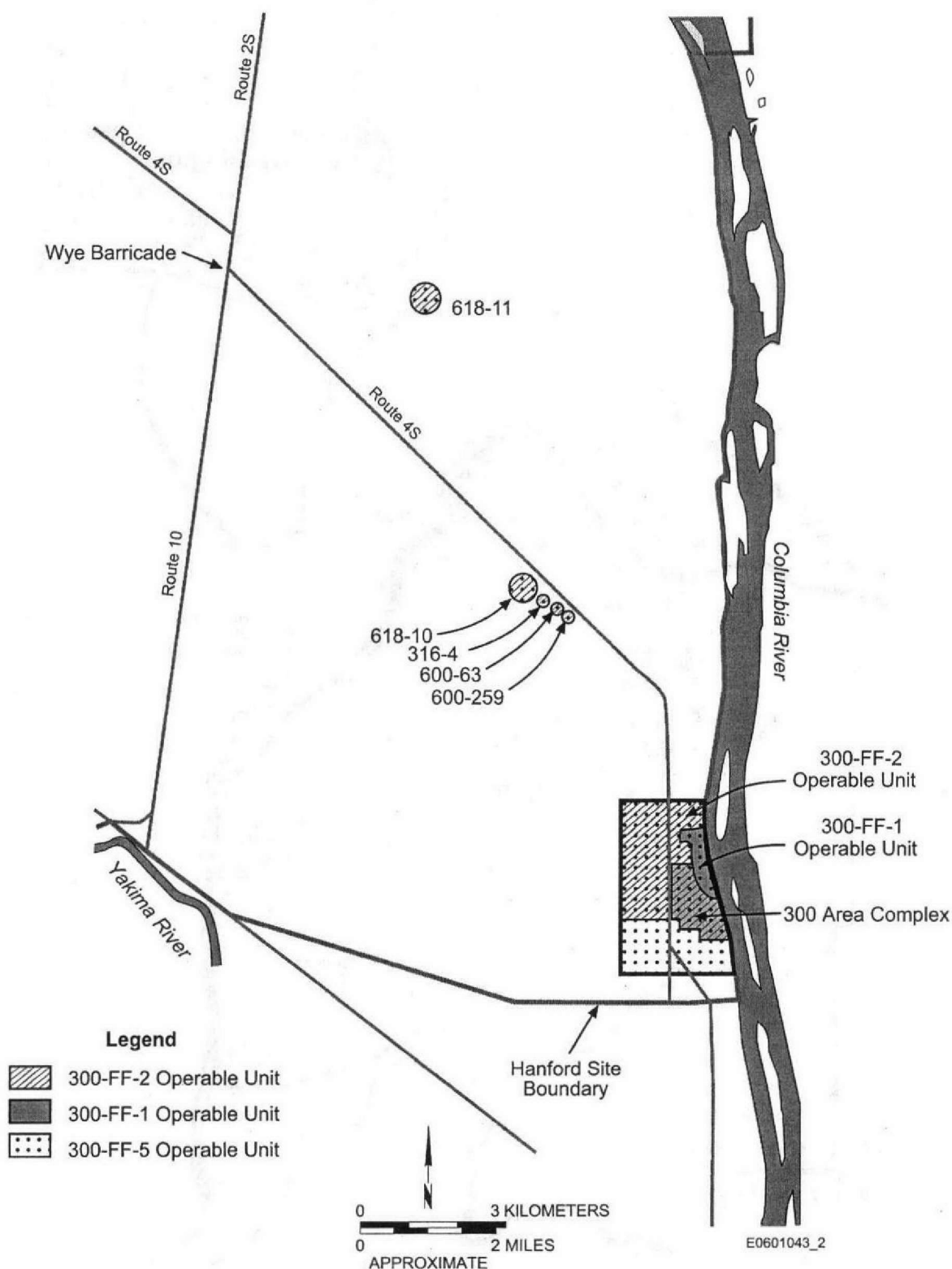


Figure 1-2. Hanford Site 300 Area Operable Units.



## Introduction

**Figure 1-3. 324 Complex and Underlying Waste Sites.**

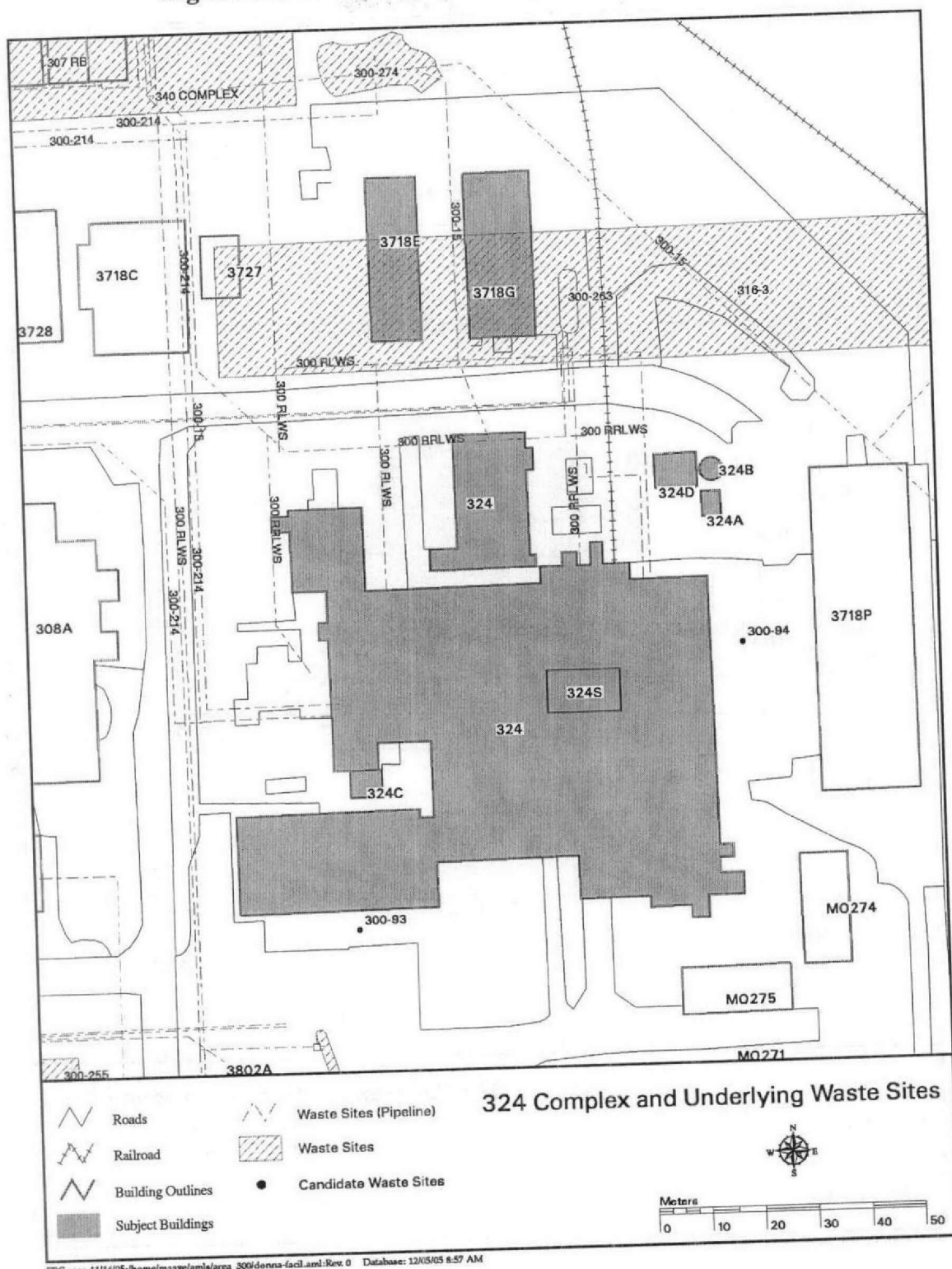
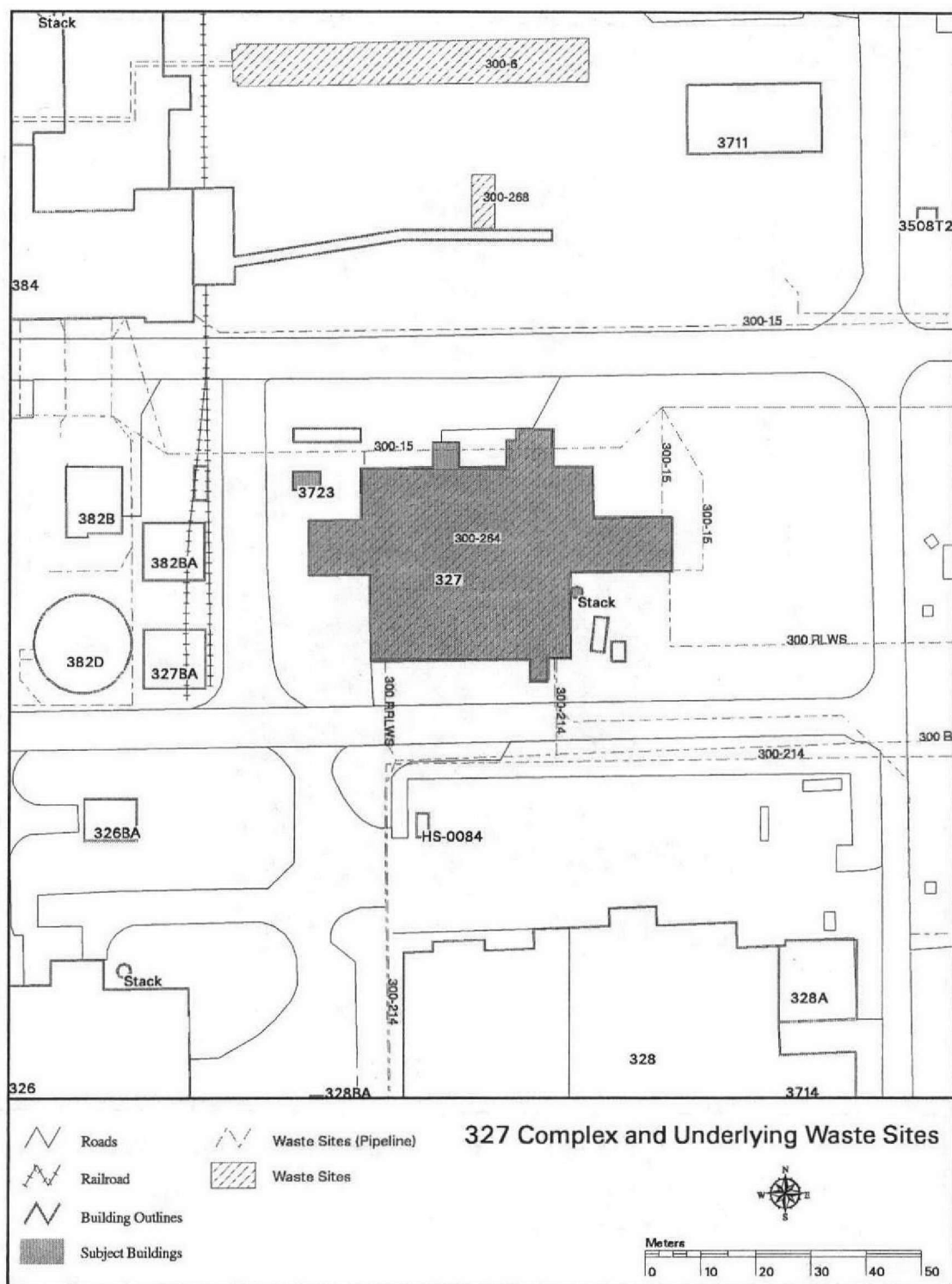


Figure 1-4. 327 Complex and Underlying Waste Sites.



## Introduction

**Table 1-1. Summary of Facilities in the Scope of Engineering Evaluation/Cost Analysis #2.**

Facility	Name	Major Facilities <sup>a</sup>	Small Facilities <sup>b</sup>	Active Facility <sup>c</sup>	Historical Significance
324	Waste Technology Engineering Laboratory	X		X	X <sup>e</sup>
324A	Stack monitoring building		X	X	X <sup>e</sup>
324B	Chemical Engineering Laboratory exhaust stack		X	X	
324C	Experimental lithium enclosure		X	X	
324D	Effluent monitoring station		X	X	
324S	Wet storage basin		X		
3718E	Storage building		X	X	X <sup>e</sup>
3718G	Storage building		X	X	
327	Post-Irradiation Test Laboratory	X		X	X <sup>d</sup>
327 Stack	327 stack		X	X	
3723	Solvent and Acid Storage Building		X	X	X <sup>e</sup>

<sup>a</sup> Major facilities are the larger, multi-room structures, generally with radiological and/or chemical contamination.

<sup>b</sup> Small facilities are small structures, generally with one to three rooms, and may or may not be radiologically and/or chemically contaminated.

<sup>c</sup> Facility is actively being used as of autumn 2005.

<sup>d</sup> The 327 Facility was determined to be a contributing property within the Hanford Site Manhattan Project and Cold War Era District and, therefore, eligible for listing in the National Register of Historic Places. The operational history was detained on an expanded Historic Property Information Form (ExHIPF).

<sup>e</sup> The 324, 324A, 3718E, and 3723 Facilities were determined to be contributing properties within the Historic District; however, no individual documentation was required and no walkthroughs were necessary.

**Table 1-2. Summary of 300-FF-2 Operable Unit Waste Sites  
Within the Engineering Evaluation/Cost Analysis #2 Geographical Area.**

Site Status	WIDS Site	Description	Overlying/Adjacent EE/CA #2 Facilities
Active sites	300 RRLWS	Retired radioactive liquid waste sewer	324, 327
	300 RLWS	Radioactive liquid waste sewer	324, 327
	300-15	Process sewer	324, 327
	300-93	324 Building stormwater runoff, miscellaneous stream #354	324
	300-94	324 Building stormwater runoff, miscellaneous stream #711	324
	300-214	Retention process sewer	327
Candidate sites	300-263	324 Building diversion tank	324
	300-265	Pipe trench between 324 and 325 Buildings	324
Facilities	300-25	324 Building	324
	300-264	327 Post-Irradiation Testing Laboratory	327

EE/CA = engineering evaluation/cost analysis

WIDS = Waste Information Data System

**Table 1-3. Summary of Tri-Party Agreement Milestones  
Relevant to the 300 Area. (3 Pages)**

Milestone	Description	Due Date
M-016-00	Complete remedial actions for all non-tank farm operable units.	September 30, 2024
M-016-00B	Complete all interim 300 Area remedial actions including the 618-10 and 618-11 Burial Grounds.  Completion of all interim remedial actions is defined as the completion of the interim ROD requirements in accordance with an approved remedial design report/remedial action work plan and obtain EPA approval of the appropriate project closeout documents. The disposition of impeding surplus facilities will be performed in accordance with Milestone M-094-00.	September 30, 2018

**Table 1-3. Summary of Tri-Party Agreement Milestones  
Relevant to the 300 Area. (3 Pages)**

Milestone	Description	Due Date
M-016-63	Submit a schedule and Tri-Party Agreement milestones to complete interim remedial actions for the 300-FF-2 waste sites and confirmatory sampling of the 300-FF-2 candidate sites. The milestone deliverable shall include at least (1) a schedule for submittals of any documents requiring EPA approval (e.g., remedial design report/remedial action work plans), (2) a schedule that defines dates for initiating and completing interim remedial actions at groups of waste sites and impeding facilities, and (3) a Tri-Party Agreement change package that includes milestones for groups of waste sites and impeding facilities that will ensure completion of Milestone M-016-00B. These schedules shall be included (and updated as appropriate) in 300 Area remedial action work plans submitted for EPA approval and will be aligned with the associated schedules required by Milestone M-094-01.	December 31, 2005
M-016-64	Complete interim remedial actions for the following 300-FF-2 waste sites: 300-259, 303M SA, 303M UOF, UPR-300-17, UPR-300-46, and 618-1. (See Table 2 in Tri-Party Agreement Change Request M-016-01-06.)	September 30, 2010
M-016-69	Complete all interim 300 Area remedial actions to include confirmatory sampling of all candidate sites listed in the 300-FF-2 ROD (except for the 618-10 and 618-11 Burial Grounds).  Completion of all interim remedial actions is defined as the completion of the ROD requirements in accordance with an approved remedial design/remedial action work plan and obtaining EPA approval of the appropriate project closeout documents. Completion of confirmatory sampling is defined as the completion of the sampling necessary to determine whether or not the waste site meets criteria for cleanup or can be closed out from the Waste Information Data System, as defined in the remedial design/remedial action work plan. The disposition of impeding surplus facilities will be performed in accordance with Milestone M-094-00.	September 30, 2015
M-89-00	Complete closure of non-permitted mixed waste units in the 324 Building REC B-cell, REC D-cell, and high-level vault.	October 31, 2005 (proposed change to September 30, 2010)
M-094-00	Complete disposition of 300 Area facilities to be defined as the 220 facilities listed in the Hanford River Corridor Closure Contract Solicitation #DE-RP06-04RL14655.  Completion of facility disposition is defined as the completion of D4 activities and obtaining EPA and/or Ecology approval of the appropriate project closeout documents. The cleanup of 300-FF-2 waste sites associated with 300 Area surplus facilities will be performed in accordance with Tri-Party Agreement Major Milestone M-016-00B.	September 30, 2015

**Table 1-3. Summary of Tri-Party Agreement Milestones  
Relevant to the 300 Area. (3 Pages)**

Milestone	Description	Due Date
M-094-01	<p>Submit a schedule and Tri-Party Agreement milestones to complete disposition of the surplus facilities in the 300 Area.</p> <p>The milestone deliverable shall include at least (1) a schedule for submittals of engineering evaluations/cost analyses, removal action memoranda, removal action work plans, closure/post-closure plans, and other documents that require EPA and/or Ecology approval; (2) a schedule that defines initiation and completion dates for the disposition of groups of surplus facilities and associated waste sites; and (3) a Tri-Party Agreement change package that includes milestones for groups of surplus facilities and associated waste sites that will ensure completion of Milestone M-094-00. These schedules shall be included (and updated as appropriate) in 300 Area removal action work plans submitted for EPA and/or Ecology approval and will be aligned with the associated schedules required by Milestone M-016-63.</p>	December 31, 2005
M-094-03	Complete disposition of the following surplus facilities: 303M, 332, 333, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, and 327.	September 30, 2010
M-094-05	Complete D4 of the 313 and 314 Facilities. Foundations, subsurface structures, and/or soil contamination can be deferred to a comprehensive remedial action program, but waste sites will be established in the interim to track this cleanup commitment.	September 30, 2006

Ecology = Washington State Department of Ecology

EPA = U.S. Environmental Protection Agency

REC = radiochemical engineering cells

ROD = Record of Decision

Tri-Party Agreement = *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 2003)

## **2.0 SITE CHARACTERIZATION**

### **2.1 BACKGROUND AND SITE DESCRIPTION**

Background information on the 300 Area is provided in the following subsections and includes operational history, land-use access and potential reuse, ecological setting, and cultural resources.

#### **2.1.1 General Description of the Hanford Site 300 Area**

In March 1943, construction of a fuel fabrication complex began at the Hanford Site in an area along the western bank of the Columbia River, approximately 12 km (7.5 mi) north of the city of Richland. This area was commonly referred to as the "300 Area." As a manufacturer of uranium fuel, the 300 Area housed the first essential step in the plutonium-production process. Nuclear fuel was fabricated from uranium shipped in from offsite support facilities. Metallic uranium was extruded into the proper shape and encapsulated in aluminum-alloy cladding (early years) or zircaloy cladding (later years). The fuel was then transported north to the 100 Area of the Hanford Site for irradiation (Figure 1-1).

The operational history of the 300 Area and its facilities varied greatly. In addition to housing the Hanford Site fuel fabrication plants, the 300 Area was the center of much of the Site's R&D projects. In connection with these activities, chemical process laboratories, test reactors, and numerous ancillary support structures were constructed. The addition of new research and laboratory facilities continued into the 1950s and 1960s to support defense and energy research. New support and laboratory facilities were added in the 1970s for further research on energy, waste management, biological sciences, and environmental sciences.

Coinciding with the Sitewide mission of transition from defense production to environmental cleanup in 1989, the focus of the 300 Area operations shifted to continued research and cleanup of contamination from past operations. The 300 Area continues to be an active industrial complex, housing many of the Hanford Site's R&D facilities and analytical laboratories. Other operations in the 300 Area include waste management and disposal, facility transition, D4, and environmental cleanup.

#### **2.1.2 Land-Use Access and Potential Reuse**

Public access to the Hanford Site, including the 300 Area, is currently restricted. Current land use in the 300 Area consists of ongoing R&D activities and remediation activities. Adjacent to and east of the 300 Area, the Columbia River is accessible to the public for recreational use (e.g., boating and sport fishing). The river segment located north of the 300 Area (referred to as the Hanford Reach) received National Monument status in 2000. In prehistoric and early historic times, the area along the banks of the Columbia River, including the 300 Area, was a focal point for camping and village sites for northwest Native American tribes. More recently, before

government acquisition of the land in January 1943, the area was used for irrigated and dry land farming and livestock grazing.

For the geographic area covered by this EE/CA, the reasonably anticipated future land use is "industrial." The eight outlying 300-FF-2 waste sites with "unrestricted use" are not within the geographic scope of this EE/CA. The industrial use assumption is consistent with the following relevant land-use planning documents:

- *The Future for Hanford: Uses and Cleanup, the Final Report of the Hanford Future Site Uses Working Group* (Drummond 1992), a scoping document supporting preparation of the *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement* (DOE 1999), describes the cleanup objective for the 300 Area as "restricted status for industrial use" under both "Cleanup Scenario A: Cleanup for Economic Development, Wildlife," and "Cleanup Scenario B: Cleanup for Agriculture and Native American Uses Outside the 300 Area."
- The *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement* (DOE 1999) and ROD (64 *Federal Register* [FR] 61615) include the 300 Area in an "industrial" land-use designation to support "new DOE missions or economic development."
- The *City of Richland Comprehensive Land Use Plan* (City of Richland 1997) identifies the 300 Area as an "urban growth area" pursuant to Washington State's "Growth Management Act of 1990" (RCW 36.70A). Land uses identified in the plan include "industrial" and "business/research park."
- The Benton County draft *Hanford Land Use Plan* (spring 2000) identifies the 300 Area as either being in the City of Richland's "urban growth area" or in a land-use zone defined by Benton County as "industrial – heavy." Within the urban growth area, the county defers land-use planning and land-use designations to the City of Richland, unless there is a marked disagreement; in this case, there is not. The draft *Hanford Land Use Plan* is expected to be incorporated into the *Benton County Comprehensive Plan* (Benton County 1998) as Chapter 13 if Benton County determines it is needed.
- An ESD (EPA et al. 2000) was issued in 2000 to expand the 300-FF-5 OU to cover all of the groundwater that underlies the 300 Area waste sites and burial grounds. This includes the groundwater beneath the outlying 300-FF-2 source sites and burial grounds.
- The *Hanford Site 300 Area Accelerated Closure Project Plan* (ACP) (FH 2000) was completed in June 2000. The ACP provided the first comprehensive closure approach for the majority of the 300 Area and acknowledged that facilities would require D4 prior to the cleanup of soil contamination areas throughout and underneath the 300 Area. The scope of the ACP included 148 facilities and 50 waste sites but excluded a number of large facilities that were in active use by the Pacific Northwest National Laboratory. The estimated cost of this work was \$784 million.

- The CERCLA ROD for the 300-FF-2 OU was issued in April 2001 (EPA et al. 2001). This decision document requires the removal and disposal of all subsurface structures and soil waste sites in the 300 Area. Soil cleanup levels established assume a future industrial use of the 300 Area (i.e., Brownfield redevelopment). The ROD did not require the demolition of all facilities in the 300 Area but stated that facilities impeding the path of cleanup would need to be removed.
- An ESD (EPA et al. 2004) was issued in 2004 to require remediation to unrestricted land-use standards for eight outlying 300-FF-2 waste sites. The industrial land use for the majority of the 300-FF-2 waste sites was unchanged.

EPA and RL awarded a grant to the City of Richland to perform a market study and reuse analysis for a "remediated" 300 Area in September 2003. The results of the study were published in March 2005 (City of Richland 2005). All previous studies had evaluated reuse options for the 300 Area assuming ongoing DOE use. This was the first evaluation of reuse given the cleanup end state. The City's Land-Use Planning and Economic Development departments worked with their counterparts in Benton County and the Port of Benton to review current DOE plans for cleanup of the 300 Area and to identify potential impacts that these plans might have on future redevelopment potential, conducted a preliminary market analysis for the potential build out of the site over a 20-year period, and developed an action plan for proceeding with reuse. The study proposed multiple land uses that were considered inconsistent with the selected remedy for the 300-FF-1 and 300-FF-2 OUs. No decisions have been made to transfer this parcel of land out of DOE's administration for the foreseeable future.

The above referenced plans document the expectations of Hanford Site stakeholders, DOE, and local land-use planning authorities with respect to future land use. They indicate that "industrial" or "general urban uses other than residential" are reasonably anticipated future land uses for the areas covered by this EE/CA.

The anticipated future industrial land-use scenario for the geographic area addressed by this EE/CA was carried forward in the 300-FF-2 OU interim action ROD (EPA et al. 2001) as the basis for exposure scenarios and associated remedial action objectives. The selected remedy for the 300-FF-2 OU includes an institutional controls element to ensure that land uses are limited to those defined in the 300 Area industrial use exposure scenario. A complete description of the industrial land-use exposure scenario and the associated institutional controls is documented in the 300-FF-2 OU interim action ROD (EPA et al. 2001). Any changes resulting in land use inconsistent with the assumptions upon which the ROD is based will be evaluated regularly in support of the CERCLA 5-year review process.

Reuse of the facilities was considered as an alternative in the 300 Area (City of Richland 2005). There was no interest by private parties in reuse of the 300 Area facilities addressed within the scope of this EE/CA. Most of the facilities are either directly above, adjacent to, or within the layback area of 300-FF-2 waste sites requiring remedial actions. Those remaining facilities that were candidates for reuse (not above or adjacent to a waste site) were screened out as not viable candidates because of the presence of hazardous materials (e.g., asbestos, lead-based paints, and

## Site Characterization

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polychlorinated biphenyls [PCBs]). Therefore, the threat of release of hazardous materials from these facilities, their proximity to the waste sites requiring remediation, the expected refurbishment costs, and the lack of interest in reuse by private parties resulted in the reuse alternative not being considered.

### 2.1.3 Flora and Fauna

The ecological setting of the Hanford Site, including the 300 Area, is described in the *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL 2005). The area surrounding the 300 Area Complex is characterized as an arid to semi-arid, shrub-steppe vegetation zone. The natural community is a sagebrush/bitterbrush/Sandberg's bluegrass association. The dominant nonriparian vegetation in the surrounding area includes cheatgrass, Sandberg's bluegrass, rabbitbrush, Russian thistle, and tumblemustard. The animal community in the surrounding area includes several species of birds, mammals, reptiles, and insect groups that have adapted to the semi-arid environment.

Within the 300 Area Complex, most of the area has been characterized as highly disturbed by industrial/waste management operations to the extent that plant communities are sparse, and complete ecological communities represented by common food webs cannot be supported. No plants or animals on Federal or state lists of endangered or threatened plants/wildlife are found in the 300 Area Complex. There are no perennial or ephemeral streams or regulated wetlands within the complex. This characterization is representative of the geographical area defined by the facilities addressed by this EE/CA.

Before initiating a project on the Hanford Site, ecological reviews are required to ensure that impacts to sensitive plant or animal species will not occur. Because the 300 Area Complex is highly disturbed, the only significant ecological issue is nesting birds protected by the *Migratory Bird Treaty Act of 1918*. At the few locations with nesting migratory birds, the nests cannot be disturbed until the young have fledged. Annual baseline reviews include surveys for nesting birds and a reconnaissance to determine if any sensitive plants are growing in the 300 Area Complex. Following the annual review, the project will be notified of any active nests or sensitive issues.

### 2.1.4 Cultural Resources

The 300 Area Complex bounds a culturally sensitive area, having been occupied prehistorically and historically by Native Americans. Most of the 300 Area Complex, including the geographical area addressed in this EE/CA, has been disturbed by building construction and general industrial activities. Therefore, it is unlikely that in situ archaeological resources will be encountered during demolition of above-ground structures or below-grade foundations associated with this EE/CA.

Prior to initiating a project on the Hanford Site, a cultural resource review is required to ensure that impacts to cultural resources are avoided where possible or mitigated as necessary. A cultural resource review will be performed in compliance with the requirements of the

*National Historic Preservation Act of 1966 (NHPA) and the Programmatic Agreement Among the U.S. Department of Energy Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington (Programmatic Agreement) (DOE-RL 1996) to verify or update actions already taken or required for the facilities identified in Table 1-1 of this EE/CA. The baseline assumption is that buildings will not be preserved in place or relocated for preservation.*

Walkthroughs of the 327 Building to identify artifacts that may have interpretive or educational value to museums were conducted on December 17, 1998, and February 15, 2005. Items identified for retention will either be retrieved and transported to an appropriate curation facility identified by DOE or will be recorded in place through photography or other appropriate means before any demolition activities occur. The physical effects of the remaining 10 properties addressed in this EE/CA have been taken into account and no additional actions are required.

## 2.2 FACILITY DESCRIPTION

The facilities addressed in this EE/CA include the 324 Building (Waste Technology Engineering Laboratory) and the 327 Building (Post-Irradiation Test Laboratory), and ancillary facilities (Table 1-1). This section provides a brief description and history of each facility. In addition, any 300-FF-2 OU waste sites that are present beneath and/or adjacent to the facilities included in this EE/CA are identified. The proximity of the facilities to one another and to underlying or adjacent 300-FF-2 OU waste sites is depicted in Figures 1-3 and 1-4 and Table 1-2.

### 2.2.1 324 Waste Technology Engineering Laboratory and Associated Structures

**2.2.1.1 324 Waste Technology Engineering Laboratory.** The 324 Building, also known as the Chemical Engineering Laboratory, is a 9,500-m<sup>2</sup> (101,700-ft<sup>2</sup>) concrete and steel structure that was constructed between 1964 and 1966. The building was designed to allow for a high degree of versatility in completing complex and varied experimentation on highly radioactive materials. These activities included chemical processing and metallurgical engineering studies on highly radioactive materials and development of approaches for waste treatment and storage. Historical information indicates that part of the building was constructed over the 618-6 Burial Ground. The burial ground was used to dispose dry low-level waste, but the contents of the 618-6 Burial Ground were moved in 1962 to allow for the new construction. Based on historical information, the 618-6 Burial Ground waste site was reclassified as a rejected waste site under Waste Information Data System (WIDS) Reclassification Form 98-078. Therefore, no further actions are required to address the 618-6 Burial Ground.

The facility contains a partial basement and first, second, and partial third floors. The building provided office and laboratory space to support R&D activities associated with waste management, structural material for use in the nuclear industry, and nuclear fuels design and construction. The radiological laboratories included two hot cell facilities, the REC and the Shielded Materials Facility, and various low-level and nonradiological laboratories including the

## Site Characterization

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Engineering Development Laboratory. Support facilities included the storage vault, which was used for storing special nuclear material, and the craft shop. Two vault areas are equipped with tanks for the temporary storage of radioactive liquid wastes and other building-generated solutions. Administrative areas include office spaces and lunchrooms. To protect against releases of radioactive material from the hot cells to the environment, integral metal liners with sumps (i.e., without drains) were installed in the cells and tank vaults. Confinement of radioactive particulate matter within the shielded cells is provided by a directed airflow through high-efficiency particulate air (HEPA) filter ventilation system. As a result of residues and internal facility spills during the conduct of past activities, the facility contains areas with significant fixed and dispersible mixed waste contamination.

The 324S wet storage basin is located in the 324 Building and was used for transfers from the cask-handling area and underwater storage of the radioactive material fuel elements. Shielded transfers of highly radioactive materials from the wet basin were accomplished by two remotely operated, enclosed mechanical transfer conveyors that are no longer operational. The basin was deactivated by removing the water, then filling the basin with sand, and concreting the surface within the cask-handling area.

**2.2.1.2 324A Stack Monitoring Building.** The 324A Building is a 7.8-m<sup>2</sup> (84-ft<sup>2</sup>) building located to the northeast of the 324 Building. It provides instrument support for the 324B exhaust stack.

**2.2.1.3 324B Chemical Engineering Laboratory Exhaust Stack.** The 324B structure is a 46-m (150-ft) -high concrete stack located to the northeast of the 324 Building and is identified as emission unit number 300 EP-324-01-S. The stack exhausts filtered air from the 324 Building. The stack is currently permitted under the Hanford Site Air Operating Permit, which is issued by Ecology (Ecology 2001).

**2.2.1.4 324C Experimental Lithium Enclosure.** The 324C Building is a 37-m<sup>2</sup> (400-ft<sup>2</sup>) building located on the west side of the 324 Building. It was used to support the experimental lithium system.

**2.2.1.5 324D Effluent Monitoring Station, 3718E Storage Building, and 3718G Storage Buildings.** The 324D Stack Sampling Facility is a 50-m<sup>2</sup> (540-ft<sup>2</sup>) metal shed located to the northwest of the 324 Building. It is currently used to store monitoring instrumentation for the 324B exhaust stack.

The 3718E Storage Building is a 278.7-m<sup>2</sup> (3,000-ft<sup>2</sup>) metal and concrete structure, located to the north of the 324 Building, and is used to store equipment and materials from the 324 Building.

The 3718G Storage Building is a 371.6-m<sup>2</sup> (4,000-ft<sup>2</sup>) metal shed, located to the north of the 324 Building, and is used to store equipment and materials from the 324 Building.

### 2.2.2 327 Post-Irradiation Test Laboratory and Associated Structures

**2.2.2.1 327 Post-Irradiation Test Laboratory.** The 327 Building is a 2,972.8-m<sup>2</sup> (32,000-ft<sup>2</sup>) building that was constructed between 1951 and 1953. The building houses the Post-Irradiation Testing Laboratory, which consists of specially equipped shielded and ventilated hot cells and laboratories designed for physical and metallurgical examination and testing of irradiated fuels, concentrated fission products, and irradiated structural materials. The primary operating area is a canyon area and connecting bays where auxiliary operations were performed. The canyon area contains shielded hot cells and cell operating stations and consoles. A transfer and storage area, including two water-filled basins, is located at the west end of the building. Bridge cranes were used to transfer drums and casks containing radioactive material/waste between cells or from the cells to the transfer/storage area. Ventilation systems were generally designed to draw air from areas of lesser contamination potential through areas having greater contamination potential before being filtered through HEPA filters and exhausted from the stack. Major operations at the laboratory ceased in 1996.

**2.2.2.2 327 Exhaust Stack.** The two stacks exhaust filtered building air from the 327 Building and are identified as emission units number EP-327-01-S and EP-327-02-V. These stacks are currently permitted under the Hanford Site Air Operating Permit (Ecology 2001), which is issued by Ecology.

**2.2.2.3 3723 Solvent and Acid Storage Building.** The 3723 Building is a 13.4-m<sup>2</sup> (144-ft<sup>2</sup>) building located at the west end of the 327 Building. It was used to store acids and solvents used at the 327 Building.

### 2.2.3 300-FF-2 Operating Unit Waste Sites

As discussed previously, the geographical area defined by the facilities addressed in the scope of this EE/CA includes underlying and adjacent waste sites as summarized in Table 2-1. These waste sites fall into the following categories:

- **Action sites** are waste sites that require excavation in accordance with the selected remedy for the 300-FF-2 OU interim action ROD (EPA et al. 2001) because they pose an unacceptable risk to human health and the environment based on the industrial exposure scenario.
- **Candidate sites** are waste sites that require additional characterization to determine if remedial action is warranted based on the risk posed to human health and the environment. If characterization results indicate that action is warranted, these candidate sites will be added to the selected remedy of the 300-FF-2 OU interim action ROD (EPA et al. 2001) and excavated.

- **Facilities** are waste sites that consist of the facilities themselves, rather than underlying soil. Instead of being included in the 300-PF-2 OU remedial action scope, these facilities were to be dispositioned as a CERCLA removal action. Consequently, these facilities must be demolished and removed in their entirety to address the waste sites as part of the removal action. Additional information on the waste sites associated with the geographical area defined by the facilities included in the scope of this EE/CA is provided in Sections 2.2.1 and 2.2.2 and the WIDS database.

### 2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

Various resources were used to help identify the hazardous substances and the nature and extent of contamination in the facilities. These resources included historical operations information, process knowledge, radiological survey reports, radiation occurrence reports, facility assessment reports, personnel interviews, facility characterization reports, vulnerability assessments, inspections, walkdowns, and knowledge of construction materials.

To the extent practicable, hazardous substances including bulk chemicals that are no longer in use have been, or will be, removed from the facilities during routine operations and surveillance and maintenance (S&M). However, residual contamination remains or will remain on facility surfaces (including the roof), in piping and ductwork, and in structural materials.

In general, the primary COCs are the following radionuclides:

- Americium-241
- Cesium isotopes
- Cobalt-60
- Curium isotopes
- Europium isotopes
- Niobium-94
- Strontium-90
- Plutonium isotopes
- Technetium-99
- Thorium isotopes
- Uranium isotopes.

Both the 324 and 327 Buildings are operating (nonreactor) nuclear facilities that undergo frequent radiological surveys and monitoring. Radiological conditions are relatively well understood; however, additional characterization of individual isotopes may be identified during development of the data quality objectives.

The facilities also contain nonradioactive hazardous substances, as either contaminants from operations or components of structural materials. The contaminants that could potentially be present in one or more of the facilities included within this removal action are as follows:

- Asbestos
- Cadmium
- Chromium
- Beryllium
- Lead
- PCBs
- Mercury (in electrical switches)
- Refrigerants (freon)
- Lubricants
- Commercial solvents
- Corrosives
- HEPA filter media (desiccants)
- Sodium vapor and mercury vapor lighting.

The concentrations of nonradioactive contaminants will be determined as needed through tasks conducted to support worker health and safety and the disposal of waste.

## **2.4 RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION**

The 324 and 327 Facilities are known to be contaminated with radioactive and nonradioactive hazardous substances. Radiological hazard analyses conducted by DOE for the 324 and 327 Buildings demonstrated a need for active controls to protect human health and the environment. The primary controls are the integrity of the facility structures and zoned ventilation systems. A qualitative discussion of the risks is provided below.

The major COCs at the facilities addressed in this EE/CA are radionuclides, which are known carcinogens. While the levels of radioactive contamination in the 324 and 327 Facilities remains significant, many of the ancillary facilities may contain low levels of radioactive contamination as surface contamination or as a part of the structural material. Hazardous substances including asbestos insulation, heavy metals (e.g., mercury in switches and lead shielding), and PCBs in building materials are also present in the facilities.

At the 324 Building, a security fence currently surrounds outdoor storage areas and ancillary facilities to limit unauthorized entrance. At the 327 Building, a security fence restricts access to the outdoor waste storage pad and the 3723 Facility. The facilities are locked and require approval prior to entry. As long as DOE retains control of the 300 Area, these institutional controls would prevent direct contact with and exposure to the hazardous substances. However, institutional controls will not prevent deterioration of the facilities or reduce the threat of release of hazardous substances to the environment. Hazardous substances could be released directly to the environment via a breach in a pipe, containment wall, roof, or other physical control as the facilities age and deteriorate. Hazardous substances could also be released to the environment through animal intrusion into the contaminated structures and systems. Historically, intrusion

and spread of contamination by rodents, insects, birds, and other organisms has been difficult to control and prevent.

As the facilities continue to age, the threat of substantial release of hazardous substances increases, and it becomes more difficult to confine these materials from the environment. The S&M activities required to confine the hazardous substances may increase the risk of potential exposure to personnel. Also, potential releases from associated waste sites pose a significant risk to human health and the environment, as described in the *Focused Feasibility Study for the 300-Ff-2 Operable Unit* (DOE-RL 2000). The facilities must also be removed to accommodate remediation of the waste sites.

The potential exposure to workers and wildlife, the potential threat of future releases, the risks associated with the hazardous substances at the facilities addressed in this EE/CA, and the risks associated with the waste sites beneath or adjacent to the facilities justify use of CERCLA removal action authority in accordance with Section 300.415 (b)(2) of the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300).

### 3.0 REMOVAL ACTION OBJECTIVES

The potential threat of release of radiological and nonradiological hazardous substances from the facilities addressed in this EE/CA poses a substantial risk to human health and the environment. The facilities contain radioactive and nonradioactive hazardous substances, either as surface contamination or as structural components. Also, many of the facilities hinder cleanup of underlying or adjacent 300 Area waste sites that pose a risk to human health and the environment. The specific contamination and risks posed by individual facilities are described in Sections 2.3 and 2.4.

In general, the scope of this removal action addresses only the facilities and small volumes of soil. It is already known that the soil beneath some of the facilities is contaminated. If extensive soil contamination is discovered, it will most likely be remediated under the authority of the 300-FF-2 OU interim action ROD (EPA et al. 2001).

Based on the potential hazards identified in Sections 2.3 and 2.4, the following removal action objectives have been identified:

- Protect human receptors from exposure to radiological and nonradiological hazardous substances in facility structures above acceptable exposure levels for nonradiological general employees
- Control the release of radiological and nonradiological hazardous substances from the facilities into the environment
- Facilitate remediation of 300 Area waste sites in accordance with the 300-FF-2 OU interim action ROD (EPA et al. 2001)
- Achieve applicable or relevant and appropriate requirements (ARARs) to the fullest extent practicable
- Safely treat, as appropriate, and dispose waste streams generated by the removal action.

In addition to the previously identified objectives, the end state of removal actions implemented in response to this EE/CA must be supportive of institutional controls prescribed by the 300-FF-2 OU interim action ROD (EPA et al. 2001) for the period between completion of the facility removal actions and the initiation of waste site remedial actions.



## **4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES**

The removal action alternatives for the facilities included in the scope of this EE/CA must be protective of human health and the environment and must not inhibit future implementation of remedial action operations for 300-FF-2 OU waste sites located in the same geographical area. As presented in Section 2.0, the principal threats to be addressed in the selection of a removal action alternative are radioactive and/or nonradioactive hazardous substances contained in/around the facilities and their contaminated surfaces, as well as the poor physical condition of selected facilities.

Based on the above considerations, the following three removal action alternatives were identified for the facilities:

- Alternative 1: No action
- Alternative 2: Decommissioning and deactivation followed by decontamination and demolition (D4)
- Alternative 3: S&M with eventual D4.

### **4.1 ALTERNATIVE 1 – NO ACTION**

Evaluation of a “no action” alternative is required to provide a baseline for comparison with other active alternatives. Under the no action alternative, facility removal activities would not be performed and current S&M activities would be discontinued. Hanford Site institutional controls (e.g., fencing, posted signs, and locked facilities) would be maintained to help warn of hazards and control worker and public access to the facilities. No other specific controls would be established for the facilities covered by this EE/CA. Because the facilities would not be decontaminated and no action would be taken to stop the facilities from deteriorating, there would be an increased threat and likelihood for a release of radiological and nonradiological hazardous substances to occur, potentially exposing workers, the public, or the environment. In addition, the no action alternative would impede remedial action progress for the 300-FF-2 OU waste sites located in the geographical area.

There is no cost associated with the no action alternative.

### **4.2 ALTERNATIVE 2 – DEACTIVATION AND DECONTAMINATION FOLLOWED BY DECOMMISSIONING AND DEMOLITION (D4)**

Alternative 2 would consist of deactivating the facilities to disposition and remove property and materials, decontaminating the buildings to levels necessary to meet waste disposal acceptance criteria, decommissioning the facilities by disconnecting permanent utilities and removing

## Identification of Removal Action Alternatives

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hazardous waste (i.e., asbestos, lead, and PCBs), and demolishing the facilities. The D4 alternative would be implemented as described in the following subsections.

### 4.2.1 Deactivation and Decontamination

The purpose of deactivation would be to identify and remove barriers (e.g., physical, chemical, and radiological) to demolition of each facility. During deactivation, cessation of ongoing missions/programs and relocation of personnel, reusable equipment, and property would be required. This may include items of historical and/or cultural significance. After personnel and reusable equipment have been removed, loose materials and equipment would be removed and disposed as required. Finally, hazardous substances and contaminated equipment and materials would be removed and disposed. These materials include, but are not limited to, PCB ballasts, batteries, lead, mercury switches, contaminated process equipment, containers, and any other material impeding demolition of the facility. Some S&M activities would be performed in support of facility deactivation, as it will be performed over an extended time period.

Following removal of these items, any remaining process and utility systems would be isolated and drains would be plugged. Piping systems would be drained and residual materials would be removed from tanks, lubricant reservoirs, and refrigerant systems.

Specific to the hot cells, contamination will be stabilized through use of grouts and fixatives. Utility services will be isolated, oil-filled windows will be drained and grouted, and manipulators will be removed and the associated ports plugged. Ventilation will be shut down and air ductwork blanked in concert with stabilization of the remaining inventory and elimination of access ports. Where necessary to facilitate transportation and disposal, the larger cells will be segmented (e.g., cut using diamond-wire saws). Structural modifications will be made to ensure cell integrity during loading, transport, and disposal. When access to the cells is available (e.g., through demolition of surrounding structure), the cells will be placed onto transport vehicles and transported to ERDF for final disposal.

After the residual solid and liquid bulk hazards have been removed, the area, equipment, systems, and components would be decontaminated (when practical) or stabilized. Decontamination or stabilization during the deactivation phase would be performed to the extent feasible to satisfy one or more of the following objectives:

- Minimize worker exposure to contaminants during demolition
- Reduce contaminated waste volumes
- Ensure that fugitive emissions do not exceed applicable air standards during demolition
- Reduce cost associated with worker protection and waste disposal.

Loose, accessible radiological contamination would be removed from components, equipment, structures, etc., if they could be decontaminated for free release or if required to meet waste acceptance criteria for the selected disposal facility. When practical, decontamination activities would be performed within the area of contamination using standard industry and best management practices, including minimizing the amount of water or cleaning fluids used.

When removal is not feasible or cost effective, contamination would be stabilized or "fixed" so contaminants would remain attached to the materials and would be less likely to be disturbed during subsequent demolition activities. Common methods of fixing contamination include painting, grouting, applying asphalt, or spreading plastic sheeting. When deactivation is complete, all hazardous and radiological components would be removed or fixed to allow safe and cost-effective demolition of the facility.

#### **4.2.2 Decommissioning and Demolition**

Immediately following facility decontamination, permanent utilities (i.e., electricity) to the building would be shut off. Upon separation from all utilities, the building is considered decommissioned.

Demolition generally means large-scale facility destruction using heavy equipment (e.g., wrecking ball, excavator with a hoe-ram, shears, and concrete pulverizer), explosives, or other industrial methods. There are no unique features of the facility structures that would suggest a need for the use of innovative demolition methods, although the 324 Building hot cells will require special removal techniques due to their size. For purposes of this evaluation, it is assumed that each hot cell will be removed in one piece, stabilized, and transported to ERDF. Consequently, no alternatives to the use of standard demolition techniques for buildings and structures were identified. Steel will not be segregated for salvage unless it is determined to be economically feasible. Piping, duct conduit, and small equipment (e.g., pumps, motors, and vacuum units) would be dismantled and recycled or will be loaded into waste containers for transport and disposal at the ERDF or another approved waste facility, in accordance with Section 4.4.

The facility slab or foundation may not be immediately removed during facility demolition if the facility is located above or adjacent to known or suspected 300-FF-2 OU waste sites. The contaminated soil associated with waste sites is excluded from this evaluation and will be addressed by the 300-FF-2 OU remedial action program.

The demolition activities may leave at-grade structures or below-ground structures in place to accomplish one or more of the following objectives:

- Limit infiltration into an underlying waste site during the period between demolition and remedial action
- Minimize/reduce potential exposure to contaminants from an underlying waste site
- Avoid double-handling and potential cross-contamination of clean backfill material that would be excavated as part of the remedial action remedy
- Avoid disrupting the operation of 300 Area utilities (e.g., electrical, sewer, and water) that are supporting active facilities.

## Identification of Removal Action Alternatives

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Should the decision be made to leave at-or below-grade structures in place, approval would be sought from the lead regulatory agency and DOE. If these decisions are made during the course of facility demolition, informal concurrence from EPA would be obtained, followed by documenting the decision through the Unit Managers' meeting. Additional considerations and actions may be necessary to defer below-grade structures for facilities where removal is driven by Tri-Party Agreement milestone schedules.

### 4.2.3 Residual Contamination

After completing the demolition portion of this alternative, residual contamination may exist in the subsurface structures and/or underlying soil. This residual contamination may be from a known 300-FF-2 OU waste site or from an area where subsurface contamination was not previously known to exist. The methodology that would be used to handle these situations as part of the D4 alternative is described in the following subsections.

**4.2.3.1 Known 300-FF-2 Operable Unit Waste Sites.** As established previously, there are contaminated waste sites beneath and adjacent to many of the facilities that are covered under the scope of this EE/CA. Those sites will be remediated under the authority of the 300-FF-2 OU interim action ROD (EPA et al. 2001) subsequent to the completion of removal actions in the area. There are also known subsurface contamination areas that are identified as 300-FF-2 OU candidate sites. Although outside of the scope of removal actions associated with this EE/CA, EPA and DOE may elect to coordinate excavation of 300-FF-2 OU waste sites or candidate sites with facility removal activities on a case-by-case basis. Factors that would be considered in the decision-making process include the following:

- Observations made during decommissioning and demolition operations
- Nature and extent of contamination
- Scheduled excavation of the waste site as part of 300-FF-2 OU remedial actions
- Impacts on utilities (e.g., water, sewer, and electrical) supporting active facilities in the 300 Area
- Projected cost.

Any 300-FF-2 OU waste sites or candidate sites that are excavated as part of the removal action process would be cleaned up to meet the remedial action objectives prescribed by the 300-FF-2 OU interim action ROD (EPA et al. 2001).

**4.2.3.2 Newly Discovered Contamination.** Newly discovered subsurface contamination (either structures or soil) would be addressed during facility removal contingent upon the following factors:

## Identification of Removal Action Alternatives

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- Nature and extent of contamination
- Proximity to other 300-FF-2 OU waste sites
- Anticipated schedules for 300-FF-2 remedial action operations in the vicinity
- Impacts on utilities (e.g., water, sewer, and electrical) supporting active facilities in the 300 Area
- Projected cost.

If the newly discovered contamination is not addressed during facility removal activities, the contamination will be reported to the WIDS. The newly discovered site(s) would be remediated in accordance with the 300-FF-2 OU interim action ROD (EPA et al. 2001). If feasible and as an alternative to handling the contamination as a discovery site and deferring action, excavation could continue at the time of facility removal until the 300-FF-2 OU remedial action objectives are achieved. Structural materials or soil exceeding cleanup criteria would be removed and disposed at the ERDF, in accordance with Section 4.4.

### 4.2.4 Cost

A cost estimate for the D4 alternative was calculated from D4 estimates that were developed for River Corridor Closure Contractor project baseline. The estimate assumed that facility removal would be completed by September 2010. That assumption is continued for this cost estimate. As summarized in Table 4-1, the nondiscounted cost for implementing the D4 alternative for the facilities included in this EE/CA would be \$61.7 million, based on present-day (2005) dollars. The nondiscounted cost is the total cost without any adjustment, based on an assumed interest rate over the duration of the project. The present-worth discounted cost is \$59.9 million and is assumed to increase in value at a rate of 2.0%<sup>8</sup> over the assumed 4-year duration of D4 of the facility.

### 4.3 ALTERNATIVE 3 – SURVEILLANCE AND MAINTENANCE (FOLLOWED BY D4)

Alternative 3 would consist of S&M of the facilities for the purpose of maintaining minimum safe conditions, followed by facility demolition (D4) to ready the area for remedial action. The D4 phase of this alternative would be implemented as described in Section 4.2. The S&M phase would take place between 2006 and 2010, and the D4 phase would be conducted from 2011 to 2015. This would support the Tri-Party Agreement Milestone M-094-00, which requires disposition of 300 Area facilities by September 30, 2015. However, this alternative would require modification to Tri-Party Agreement Milestone M-94-03, which calls for disposition of

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<sup>8</sup> The discount rate used is the 5-year value of 2.0% from OMB Circular A-94, Appendix C (OMB 1992). This value of 2.0% was published in 2005 and is valid through 2006.

## Identification of Removal Action Alternatives

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the 324, 324B, and 327 Buildings by September 30, 2010. In addition, a modification to Tri-Party Agreement Milestone M-89-00 would be required, as the milestone currently calls for closure to be complete by 2010.

During the S&M phase of this alternative, existing institutional controls would be maintained to warn area workers of potential hazards and would restrict public access to the 324 and 327 Facilities to workers with appropriate training. The S&M measures would include routine radiological and hazard monitoring of the facilities, safety inspections, basic facility maintenance, and system operations as required based on the applicable safety requirements. Activities would be balanced to reduce worker hazards and the potential for contaminant release. Facility repairs would be performed as necessary to ensure facility integrity for containment of hazardous substances within the structure.

In general, as facilities age and deteriorate, S&M must become more aggressive over time, and worker safety is a critical factor. Without an increasingly aggressive S&M program, the threats associated with unplanned releases to the environment and injury or exposure to workers would increase. Conversely, an aggressive S&M program would require more frequent worker entry into the facilities to perform more invasive maintenance procedures, which would increase the potential for exposure to workers. In addition, personal protection requirements to maintain a more aggressive program could continually increase, which would add to the cost.

Following the S&M phase of this alternative, the facilities would undergo deactivation and decontamination, followed by facility decommissioning and demolition. The D4 phase of the alternative is assumed to be performed as described in Section 4.2 to support remediation of the 300-FF-2 OU waste sites by September 30, 2015, in accordance with Tri-Party Agreement Milestone M-094-00.

The total nondiscounted cost of implementing the S&M alternative for the facilities included in the scope of this EE/CA would be \$93.5 million, based on present-day (2005) dollars (Table 4-2). The nondiscounted cost is the total cost without any adjustment, based on an assumed interest rate over the duration of the project. The present-worth discounted cost is \$81.2 million and is assumed to increase in value at a rate of 2.5%<sup>9</sup> over the 9-year duration<sup>10</sup> of the project. Annual S&M costs are based on actual costs and are grouped by major facility (324 or 327 Facilities). As previously discussed, the S&M phase of this alternative is assumed to be performed for 5 years. The D4 phase is assumed to start by 2011 to allow for completion by 2015, as required by Tri-Party Agreement Milestone M-094-00. Costs for the D4 phase were calculated as described in Section 4.2 and were added to the estimate for the S&M phase to determine the total cost for the alternative.

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<sup>9</sup> The discount rate used is the 10-year value of 2.5% from OMB Circular A-94, Appendix C (OMB 1992). This value was published in 2005 and is valid through January 2006.

<sup>10</sup> The 9-year duration is based on starting in 2005 and meeting the Tri-Party Agreement Milestone M-94-03, completion date of 2010.

## **4.4 COMMON ELEMENTS**

Common elements that are shared between the D4 alternative and the S&M alternative include historical properties management and waste management, as discussed in the following subsections.

### **4.4.1 Historical Properties Management**

Alternatives 2 and 3 share a common end state that would result in the demolition and disposal of all facilities included in the scope of this EE/CA. The baseline assumption used to develop this EE/CA is that the buildings will not be preserved in place or relocated for preservation. Physical effects, up to and including demolition, of all facilities identified in this EE/CA have been mitigated, as described in Section 2.1.4. However, any tagged artifacts that may have interpretive or educational value will either be retrieved and transported to an appropriate curation or photographed in place prior to facility prior to demolition.

### **4.4.2 Waste Management**

Alternatives 2 and 3 would each generate waste that requires appropriate disposal. Opportunities for waste minimization and pollution prevention would be evaluated for each alternative to the extent practicable. Materials that can be effectively decontaminated and noncontaminated waste that can be effectively segregated from contaminated waste would be recycled or sent to a sanitary landfill for disposal. Any noncontaminated water that is encountered during the removal action could be used for dust suppression.

Waste for which no reuse, recycle, or decontamination options are identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed) and disposed accordingly. The preferred pathway for disposal of contaminated waste would be the ERDF. Construction and operation of the ERDF was authorized via a separate CERCLA ROD (EPA et al. 1995) and subsequent ROD amendments. The ERDF is an engineered structure designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and a final cover.

In 1996, an ESD (Ecology et al. 1996) clarified the ERDF ROD (EPA et al. 1995) for eligibility of waste generated during Hanford Site cleanup activities. In accordance with the ESD, any low-level waste, mixed waste, and hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., facility demolition, RCRA past-practice, and investigation-derived wastes) is eligible for ERDF disposal, provided that appropriate CERCLA decision documents are in place and that the waste meets ERDF waste acceptance criteria (BHI 2002). Consequently, contaminated waste generated during the removal action proposed in this EE/CA would be eligible for disposal at the ERDF. Previous EE/CAs for other Hanford Site facilities have shown that the ERDF provides a high degree of protection for human health and the environment and is more cost effective than other disposal site options for comparable waste. Estimated waste volumes that would be generated for disposal at the ERDF would not be expected to significantly impact capacity limitations at the ERDF. The waste volumes in this

## Identification of Removal Action Alternatives

document have been taken into account for ERDF planning purposes. Further discussions of the construction and operation of the ERDF are not within the scope of this EE/CA.

While most waste generated during the removal action is anticipated to meet ERDF waste acceptance criteria, some waste may require treatment before disposal. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting. For waste that cannot be sent to the ERDF, it is expected that treatment, storage, and disposal (TSD) can occur at other Hanford Site facilities with an existing CERCLA offsite acceptability determination, such as the Central Waste Complex or the Effluent Treatment Facility, subject to final disposition under CERCLA. If wastes containing CERCLA hazardous substances are encountered that must be sent to a facility outside of the Hanford Site or to a facility at Hanford that does not have an existing acceptability determination for storage, treatment, or disposal, EPA would establish an acceptability determination for the proposed facilities in accordance with 40 CFR 300.440.

**Table 4-1. Deactivation/Decontamination and Decommissioning Cost Summary.<sup>a,b</sup>**

Facility or Group of Facilities	Facility Name	Deactivation, Decontamination, Decommissioning, and Demolition (\$K)
324	Waste Technology Engineering Laboratory	\$40,079
324A	Stack Monitoring Facility	Included in 324 Facility cost
324B	324 stack	\$265
324C	Experimental lithium enclosure	Included in 324 Facility cost
324D	Effluent monitoring station	Included in 324 Facility cost
324S	Wet storage basin	Included in 324 Facility cost
3718E	Storage building	\$117
3718G	Storage building	\$157
327	Post-Irradiation Test Laboratory	\$21,075
3723	Solvent and Acid Storage Building	\$12
327 Stack	327 stack	Included in 327 Facility cost
<b>Nondiscounted Cost<sup>c</sup></b>		<b>\$61,705</b>
<b>Present-Worth Discounted Cost<sup>d</sup></b>		<b>\$59,914</b>

<sup>a</sup> All costs are 2005 dollars, based on current project estimates. The D4 costs include estimated Environmental Restoration Disposal Facility disposal costs.

<sup>b</sup> The target for completion of D4 is 2010 in support of Tri-Party Agreement Milestone M-94-03.

<sup>c</sup> The nondiscounted cost is the total cost without any adjustment based on an assumed interest rate over the duration of the project.

<sup>d</sup> The present-worth discounted cost is assumed to increase in value at a rate of 2.0% over the assumed 5-year duration of the project. The discount rate used is the 5-year value of 2.0% is from Office of Management and Budget (OMB) Circular A-94, Appendix C (OMB 1992). This value was published in 2005 and is valid through January 2006. The target for completion of D4 is 2010 in support of Tri-Party Agreement Milestone M-94-03.

D4 = deactivation, decontamination, decommissioning, and demolition

Tri-Party Agreement = Hanford Federal Facility Agreement and Consent Order (Ecology et al. 2003)

**Table 4-2. Surveillance and Maintenance and Deactivation/Decontamination and Decommissioning Cost Summary.<sup>a,b</sup>**

Facility or Group of Facilities	Facility Name	S&M (\$K) <sup>c</sup>	D4 (\$K)	Total (\$K)
324 Facilities		\$23,922		\$23,922
324	Waste Technology Engineering Laboratory		\$40,079	\$38,992
324A	Stack Monitoring Facility		Included in 324 Facility cost	Included in 324 Facility cost
324B	324 stack		\$265	\$258
324C	Experimental lithium enclosure		Included in 324 Facility cost	Included in 324 Facility cost
324D	Effluent monitoring station		Included in 324 Facility cost	Included in 324 Facility cost
324S	Wet storage basin		Included in 324 Facility cost	Included in 324 Facility cost
3718E	Storage building		\$117	\$114
3718G	Storage building		\$157	\$153
327 Facilities		\$7,890		\$7,890
327	Post-Irradiation Test Laboratory		\$21,075	\$20,503
3723	Solvent and Acid Storage Building		\$12	\$11
327 Stack	327 stack		Included in 327 Facility cost	Included in 327 Facility cost
<b>Nondiscounted Cost<sup>d</sup></b>		<b>\$31,812</b>	<b>\$61,705</b>	<b>\$93,517</b>
<b>Present-Worth Discounted Cost<sup>e</sup></b>				<b>\$81,227</b>

<sup>a</sup> All costs are 2005 dollars, based on current project estimates. The D4 costs include estimated Environmental Restoration Disposal Facility disposal costs.

<sup>b</sup> The Tri-Party Agreement Milestone M-094-03 target date for completion of D4 is 2010.

<sup>c</sup> Annual S&M costs are based on fiscal year 2005 actual costs of \$3,987,000 for the 324 Facility and \$1,315,000 for the 327 Facility.

<sup>d</sup> The nondiscounted cost is the total cost without any adjustment, based on an assumed interest rate over the duration of the project.

<sup>e</sup> The present-worth discounted cost is assumed to increase in value at a rate of 2.5% over the assumed 9-year duration of the project. The discount rate used is the 10-year value of 2.5% is from Office of Management and Budget (OMB) Circular A-94, Appendix C (OMB 1992). This value was published in 2005 and is valid through January 2006.

D4 = deactivation, decontamination, decommissioning, and demolition

S&M = surveillance and maintenance

Tri-Party Agreement = *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 2003)



## 5.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In accordance with CERCLA requirements, removal action alternatives are evaluated against the following three criteria:

- Effectiveness
- Implementability
- Cost.

Each criterion is briefly summarized in Table 5-1.

A detailed analysis of the no action (Alternative 1), D4 (Alternative 2), and S&M (Alternative 3) alternatives being considered in this EE/CA relative to each criterion is provided in the following subsections, followed by a comparison of the alternatives against one another relative to each criterion. The results of the evaluation will be used to identify a preferred removal action alternative. Public acceptance of the preferred alternative will be evaluated after the public is given an opportunity to review and comment on this EE/CA. State acceptance will be evaluated by Ecology. After addressing comments, EPA will document the selected removal action in an action memorandum.

### 5.1 EFFECTIVENESS

To provide a more comprehensive evaluation in this EE/CA, the effectiveness criterion has been divided into several subcategories. A description of the subcategories is presented in Table 5-1. The following subsections evaluate each of the effectiveness subcategories.

#### 5.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is the primary objective of the removal action. This criterion addresses whether the action achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. This criterion must be met for a removal action to be eligible for consideration. Evaluation of the alternatives against this criterion is based on qualitative analysis and assumptions regarding the inventory of hazards in the facilities to be addressed by the removal action.

The no action alternative (Alternative 1) would not eliminate, reduce, or control risks to human health and the environment. Because implementation of this alternative would not meet removal action objectives or the threshold criterion for overall protectiveness, and would not support remedial activities on the 300-FF-2 waste sites, it cannot be considered as a viable alternative. Consequently, the no action alternative is not carried forward for further evaluation.

## Analysis of Removal Action Alternatives

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Alternatives 1 and 2 would both meet the threshold criterion for overall protection of human health and the environment. In Alternative 2 (D4), hazardous substances would be removed so the facilities do not present a risk to workers and do not obstruct remediation of 300-FF-2 waste sites. Facilities would be monitored and maintained under the S&M alternative (Alternative 3) to control releases of hazardous substances; in addition, public and worker access would be restricted until D4 activities are implemented. Remediation of the 300-FF-2 OU waste sites would be delayed until the facilities undergo demolition. Both alternatives would achieve the same end state, but the S&M alternative would take longer.

### 5.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses whether a removal action will, to the extent practicable, meet ARARs and other Federal and state environmental statutes. The ARARs must be met for onsite CERCLA actions (CERCLA, Section 121[d][2]). Onsite actions are exempted from obtaining Federal, state, and local permits (CERCLA, Section 121[e][1]). Nonpromulgated standards are also to be considered, such as proposed regulations and regulatory guidance, to the extent necessary for the removal action to be adequately protective. The ARARs criterion must be met for an alternative to be eligible for consideration.

Key ARARs associated with Alternatives 2 and 3 include waste management standards, standards controlling releases to the environment, and standards for protection of cultural and ecological resources. The actions proposed for both alternatives would meet these preliminary ARARs, although the potential for noncompliance with standards for controlling releases to the environment could increase as the facilities age under the S&M alternative. A detailed discussion of how the removal action alternatives would comply with ARARs is provided in Appendix A, including other advisories or guidance documents to be considered. Final selection of ARARs to be met during implementation of the selected removal action will be documented in the CERCLA action memorandum associated with this EE/CA.

### 5.1.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion addresses whether the alternative leaves an unacceptable risk after the removal action has been taken. It also refers to the ability of a removal action to maintain long-term reliable protection of human health and the environment after removal action objectives have been met.

The D4 alternative (Alternative 2) would be protective of human health and the environment for the long term and would provide a permanent removal action for the facilities covered by this EE/CA. Structures would be removed and disposed at approved facilities, such as the ERDF or offsite landfills, based on the presence or absence of contamination, thereby creating an effective and permanent removal action with regard to the facilities.

The S&M alternative (Alternative 3) would be as effective as the D4 alternative in protecting human health and the environment in the long term. Because contamination would be left in

place with this alternative, the risk of exposure and release would remain and could potentially increase. Both alternatives are equally effective for this criterion.

#### **5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment**

Reduction of toxicity, mobility, or volume through treatment technologies may be employed in a removal action. This criterion assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. Destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants could accomplish this. Reduction of toxicity, mobility, and/or volume through treatment contributes to overall protectiveness.

Both Alternatives 2 and 3 would generate waste that might require treatment to meet waste acceptance criteria at the ERDF or other disposal facilities. However, the fraction of waste requiring treatment would likely be low, and neither alternative would involve a specific treatment technology as part of the removal action. The volume of waste requiring treatment would be the same for both alternatives. Both alternatives would involve segregation activities and employ recycling options for noncontaminated material to reduce the volume of material disposed. Alternatives 2 and 3 are considered equally effective for this criterion.

#### **5.1.5 Short-Term Effectiveness**

The short-term effectiveness criterion refers to an evaluation of the speed with which the remedy achieves protection. The criterion also refers to any potential adverse effects on human health and the environment during the implementation phases of the removal action.

There would be the potential for worker exposure and releases to the environment in implementing either Alternative 2 or Alternative 3. Early in the implementation period, there would be greater potential exposure to humans with the D4 alternative (Alternative 2) because Hanford Site workers would be entering contaminated facilities more often and would be handling contaminated materials as part of the removal action. Handling contaminated materials would also increase the potential for a release to the environment, especially to the air. Adherence to all appropriate environmental regulations would ensure that the potential for release would be minimized. Effective planning, limiting time in contaminated areas, and providing the necessary protective clothing and equipment appropriate to the tasks would mitigate the risk to workers. Contaminated materials would be removed and disposed at the ERDF or other approved disposal facilities, thus reducing the potential for a contaminant release.

The S&M alternative (Alternative 3) would present less risk to workers and the environment in the near term because it would involve fewer intrusive activities that could result in contaminant releases. As Hanford Site workers enter the contaminated facilities to perform S&M activities, there would be a potential for personnel exposure that would become greater as the facilities deteriorate and the need for increased activities and major repairs arises. There would be a further increase in worker exposure and the potential for a release when the facilities finally undergo D4.

## Analysis of Removal Action Alternatives

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Both Alternatives 2 and 3 ultimately achieve the same end state. Because this end state would be achieved earlier by implementing the D4 alternative (Alternative 2), it is considered more effective in achieving protectiveness in the short term.

### 5.2 IMPLEMENTABILITY

Implementability refers to the technical and administrative feasibility of a removal action, including the availability of materials and services needed to implement the selected solution.

Both Alternatives 2 and 3 would be implementable, although there may be greater challenges associated with the S&M alternative (Alternative 3).

The D4 alternative (Alternative 2) could be readily implemented with no difficulty. Environmental restoration workers at the Hanford Site are experienced in performing D4 activities and waste disposal operations. Techniques and lessons learned from previous successful projects would be applied to planning and execution of fieldwork. The trained personnel required to implement the alternative are readily available within the existing work force at the Hanford Site. Materials and equipment that would be needed are easily obtained. In terms of waste disposal, the ERDF has been in operation since 1996, and procedures for handling CERCLA waste are well established. Offsite disposal facilities are available for noncontaminated material that is segregated during field operations. Specialized materials, equipment, or services would be required and are only expected to be needed to support removal of the hot cells.

These buildings are currently undergoing S&M; however, due to facility age, obtaining replacement components and equipment is becoming increasingly difficult. Therefore, as time passes, the S&M alternative (Alternative 3) will present more overall risk that would not be encountered under the D4 alternative (Alternative 2).

With initiation of facility removal assumed to be deferred until 2011 for the 324 Building and 2012 for the 327 Building, the S&M alternative would present a potential delay with respect to maintaining remediation progress because access to some of the 300-FF-2 OU waste sites would be affected.

From a community and state acceptance standpoint, both Alternatives 2 and 3 would be implementable. The public is generally in favor of any progress that is made concerning cleanup of the Hanford Site. The D4 alternative (Alternative 2) likely would be considered more favorable to the public because it exhibits observable progress sooner. However, the facilities and sites in this EE/CA do not represent significant public concern at this time, and a cleanup initiation delay for up to 6 years would probably not be considered negligent, as long as S&M prevents hazardous material from being released to the environment. The S&M alternative (Alternative 3), however, would require a change to Tri-Party Agreement Milestone M-94-03,

## Analysis of Removal Action Alternatives

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which currently calls for complete disposition of the 324 and 327 Buildings to be completed by September 2010.

Overall, Alternatives 2 and 3 are comparable with respect to implementability. However, the D4 alternative (Alternative 2) would facilitate more timely cleanup of the 300-FF-2 OU waste sites in the geographical area.

### 5.3 COST

The cost criterion evaluates the cost of the alternatives and includes capital, operation and maintenance, and monitoring costs. All of the costs included in this document are estimates. Further refinement of the costs will be developed in accordance with the design documentation that will be prepared for complete action.

Total present-worth costs (in 2005 dollars) of implementing Alternatives 2 and 3 for the facilities included in the scope of this EE/CA would be \$59.9 million and \$81.2 million, respectively. The D4 alternative (Alternative 2) is less costly than the S&M alternative (Alternative 3) because the same end state would be reached without the unnecessary cost associated with the additional phase of the S&M alternative.

### 5.4 OTHER CONSIDERATIONS

Secretarial policy (DOE 1994) and DOE O 451.1B require that CERCLA documents incorporate NEPA values such as analysis of cumulative, offsite, ecological, and socioeconomic impacts to the extent practicable, in lieu of preparing separate NEPA documentation for CERCLA activities. The NEPA regulations (40 CFR 1502.16) specify evaluation of the environmental consequences of proposed alternatives. These include the following potential effects:

- Transportation resources
- Air quality
- Cultural and historical resources
- Noise, visual, and aesthetic effects
- Environmental justice
- Socioeconomic aspects of implementation.

The NEPA process also involves consideration of several issues, such as cumulative impacts (direct and indirect), mitigation of adversely impacted resources, and the irreversible and irretrievable commitment of resources. A NEPA values evaluation of the two alternatives is presented in the following subsections. The no action alternative (Alternative 1) is excluded from the evaluation because it failed to meet the overall protection threshold criterion as documented in Section 5.1.

## Analysis of Removal Action Alternatives

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### 5.4.1 Transportation Impacts

Neither of the removal alternatives (Alternatives 2 and 3) would be expected to create any long-term transportation impacts. Both alternatives would likely have short-term impacts on local Hanford Site traffic associated with transportation of waste, equipment, and personnel.

Contaminated demolition debris and contaminated soil would be transported from the 300 Area to the ERDF. Both alternatives would also require hauling geologic material to the 300 Area for backfill. The quantities transported would be the same in both Alternatives 2 and 3, but would occur later for the S&M alternative (Alternative 3). No modifications to the existing Hanford Site transportation infrastructure would be required to support waste shipments. Minimal offsite impacts would be expected from transportation of waste to offsite sanitary landfills.

Both Alternatives 2 and 3 would also involve transportation impacts from supplying equipment and materials to the 300 Area and from increases in the workforce traffic. Transportation impacts related to supplies and work force would be expected to be similar for these alternatives and would have minimal impact on the transportation infrastructure.

If adverse impacts to transportation were to be detected, activities would be modified or halted until the impact is mitigated. Potential mitigation measures for transportation include preparing a transportation safety analysis to identify the need for specific precautions to be taken before any transport activities, closing roads during waste transportation, or use of the existing rail infrastructure.

### 5.4.2 Air Quality

Both Alternatives 2 and 3 would have potential air quality impacts associated with point-source and fugitive emissions of contaminants during facility deactivation, decontamination, and demolition. There also would be potential dust emissions associated with excavation of backfill at borrow sites and placement of the material in the 300 Area. There are also air impacts associated with operation of the building ventilation systems. Impacts would be the same for the two alternatives but would occur later for the S&M alternative (Alternative 3). Appropriate controls will be evaluated during design to ensure that emissions are controlled. No impacts on local or regional air quality would be expected, as long as appropriate control measures are implemented. Potential mitigation measures for air resources include the following:

- Using HEPA-filtered ventilation systems on the buildings during much of deactivation
- Removing or stabilizing facility contaminants before demolition
- Using local exhaust and containment systems during deactivation and demolition
- Packaging and handling wastes to prevent releases
- Implementing dust-suppression measures (both water and water treated with fixatives) to control fugitive dust

- Covering loads when hauling wastes and backfill materials.

### 5.4.3 Natural, Cultural, and Historical Resources

The potential impacts to natural, cultural, and historical resources are discussed in the following subsections.

**5.4.3.1 Natural Resources.** Natural resources include biological resources such as wildlife habitat, plants, and animals, and physical resources such as land, water, and air. As documented in Section 2.0, the 300 Area Complex is highly disturbed from industrial operations and does not include any sensitive biological areas. Potential impacts to biological resources would be a greater concern at borrow sites because they could be located in otherwise undisturbed areas. Potential adverse impacts at the ERDF, which is located in an area of high-quality, shrub-steppe habitat, were addressed in the *Remedial Investigation and Feasibility Study Report for the Environmental Restoration Disposal Facility* (DOE-RL 1994). Both Alternatives 2 and 3 would also have positive impacts on biological resources because the potential for exposure to contaminants would be minimized through removal. Potential impacts to air resources were discussed previously. For both Alternatives 2 and 3, there is also a potential for impacts to land and water resources if contaminants were to be released during the removal action. As facilities are demolished, there would be a potential for precipitation to contact contaminants and carry them to the soil, where they could then migrate to groundwater. Measures that would be implemented to mitigate potential impacts include the following:

- Stockpiling clean topsoil during site preparation for use as backfill
- Minimizing the size of construction areas
- Performing ecological surveys before remediation
- Avoiding work in the area of a nest during the nesting season
- Using existing borrow pits or locating borrow sites in low-quality habitat areas
- Revegetating disturbed areas (as applicable)
- Making borrow sites deeper to minimize the lateral extent of disturbance
- Providing engineering/administrative controls to prevent contaminant releases.

**5.4.3.2 Cultural Resources.** Cultural resources (i.e., archaeological and traditional) are unlikely to be encountered during activities at facilities located within the 300 Area Complex because this area is heavily disturbed from past operations, as discussed in Section 2.0. Cultural resources might be present at borrow sites, which are typically located in otherwise undisturbed areas. Adverse impacts to cultural resources could occur if such resources are encountered and appropriate mitigating actions are not taken. A cultural resource mitigation plan has been prepared to guide activities, including avoiding known cultural resources and traditional-use areas whenever possible, conducting cultural resource reviews before subsurface intrusion or building demolition, and training construction workers to recognize and report potential cultural resources. If cultural resources are encountered, the State Historic Preservation Office and Native American Tribes would be consulted to determine appropriate actions for mitigation, resource documentation, or recovery.

## **Analysis of Removal Action Alternatives**

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**5.4.3.3 Historical Resources.** A programmatic agreement (DOE-RL 1996) requires that DOE document the historic significance of the Hanford Site and assess the contents of the historic buildings and structures before any future deactivation, decontamination, or decommissioning activities can be conducted. An associated treatment plan (DOE-RL 1998) identifies the 327 Building for individual documentation and assessment. All documentation and assessment requirements have been fulfilled. The outstanding mitigation requirement relates to the retrieval or recording/photographing in place of historic items that were identified during the building assessment.

### **5.4.4 Noise, Visual, and Aesthetic Effects**

Both Alternatives 2 and 3 would increase noise levels, but the impacts would be of short-term duration during removal actions and would not affect offsite noise levels. Positive impacts on visual and aesthetic effects would be realized, but the benefits would occur earlier with the D4 alternative (Alternative 2). The existing above-grade structures of the facilities addressed in this EE/CA would be removed, and the sites would be backfilled and contoured to natural grade.

### **5.4.5 Socioeconomic Impacts**

The local economy is closely tied to Hanford Site employment, so changes in the work force associated with the facilities addressed in this EE/CA could potentially affect local socioeconomics, although impacts would be relatively small compared to the current Hanford Site workforce. The number of full-time equivalent workers required in a given year to support the removal actions would be on the order of a few dozen. Alternatives 2 and 3 would meet the principles established by the Hanford Advisory Board Work Group for cultural/socioeconomic impacts and allow for workforce transition to cleanup activities. Effects on community social services, public services, and recreation would probably be imperceptible because so few employees would be involved. No mitigation measures have been identified for socioeconomics.

### **5.4.6 Environmental Justice**

Health or socioeconomic impacts to any of the local communities would be minimal for both Alternatives 2 and 3; therefore, environmental justice issues (i.e., high and disproportionate adverse health and socioeconomic impacts on minority or low-income populations) would not be a concern.

### **5.4.7 Irreversible and Irretrievable Commitment of Resources**

Removal actions at the facilities included in the scope of this EE/CA could require an irreversible or irretrievable commitment of resources, particularly land use and geologic materials.

Under both Alternatives 2 and 3, there would be a loss of land use because land area at the ERDF would be irretrievably committed for the disposal of the demolition waste. However, there

## Analysis of Removal Action Alternatives

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would be a substantial gain in land use at the sites where the facilities are located. The facilities would eventually be removed. In combination with future soil cleanup, this would allow for restricted future use at these sites as defined by the remedial action program. Contamination above industrial land-use, direct-exposure cleanup levels might remain at depth, even after soil contamination is addressed in accordance with the 300-FF-2 interim action ROD (EPA et al. 2001), and this would require restrictions on deep excavations and well drilling.

Both Alternatives 2 and 3 would also require an irretrievable and irreversible commitment of resources in the form of petroleum products (e.g., diesel fuel and gasoline) and geologic materials required to backfill and recontour the sites following demolition. Geologic material would be obtained from onsite borrow pits. To the extent practicable, measures would be taken to minimize the quantity of backfill required. Quantities of required petroleum and geologic resources would be the same for both alternatives. In addition, there would be a small increase in the amount of material required for the closure barrier at the ERDF.

### 5.4.8 Cumulative Impacts

Removal actions at the facilities included in the scope of this EE/CA could have impacts when considered together with impacts from past and foreseeable future actions at and near the Hanford Site. Authorized current and future activities in the 300 Area that might be ongoing during removal actions include soil and groundwater remediation, laboratory operations, R&D activities, and S&M of facilities. Other Hanford Site activities include D4 of a variety of facilities; soil and groundwater remediation, operation and closure of underground waste tanks, construction and operation of tank waste vitrification facilities, removal and storage of spent nuclear fuel and waste from the K Basins, and operation of the Energy Northwest commercial reactor. Activities near the Hanford Site include a privately owned radioactive and mixed waste treatment facility, a commercial fuel manufacturer, and a titanium reprocessing plant.

Both removal action Alternatives 2 and 3 would have minimal impacts on transportation; air quality; natural, cultural, and historical resources; noise, visual, and aesthetic effects; public health; and socioeconomics. Therefore, cumulative impacts with respect to these values are expected to be insignificant.

Both Alternatives 2 and 3 would require long-term land-use restrictions in the 300 Area Complex and excavation of geologic material from borrow sites. As documented in Section 2.0, planning documents establish the 300 Area Complex as a restricted-use area to be used for industrial use. Consequently, the land-use restrictions that would be imposed by either Alternative 2 or 3 would be compatible with other decisions and would not result in a cumulative impact for land use.

Under both Alternatives 2 and 3, there would be a cumulative impact with respect to the irretrievable and irreversible commitment of resources. The proposed 300 Area actions constitute only one of numerous actions requiring material for barriers and backfill at the Hanford Site. The total quantity of geologic materials required for Hanford Site actions was evaluated in separate NEPA documentation (DOE-RL 2001).

Table 5-1. Summary of Evaluation Criteria.

Effectiveness <sup>a</sup>	<b>Overall Protection of Human Health and the Environment.</b> The primary objective and a "threshold" criterion that must be met for a removal action to be eligible for consideration. This criterion addresses whether the alternative achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. Assessments of the other evaluation criteria are also drawn upon. Evaluation of the alternatives against this criterion was based on qualitative analysis and assumptions regarding the inventory of hazards in the facilities to be addressed by this removal action.
	<b>Compliance with ARARs.</b> Like overall protection of human health and the environment, compliance with ARARs is a threshold criterion that must be met for an alternative to be eligible for consideration. This criterion addresses whether a removal action will, to the extent practicable, meet ARARs and other Federal and state environmental statutes. The ARARs must be met for onsite CERCLA actions (40 CFR 300.415[j]). Onsite actions are exempted from obtaining Federal, state, and local permits (CERCLA, Section 121[e][1]). Nonpromulgated standards, such as proposed regulations and regulatory guidance, are also to be considered, to the extent necessary for the removal action to be adequately protective.
	<b>Long-Term Effectiveness and Permanence.</b> The long-term effectiveness and permanence criterion addresses whether the alternative leaves an unacceptable risk after the removal action has been completed. It also refers to the reliability of a removal action to maintain long-term protection of human health and the environment after implementation.
	<b>Reduction of Toxicity, Mobility, or Volume Through Treatment.</b> The reduction of toxicity, mobility, or volume through treatment criterion refers to an evaluation of the anticipated performance for treatment technologies that may be employed in a removal action. It assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. This could be accomplished by destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants. Reduction of toxicity, mobility, and/or volume contributes to overall protectiveness.
	<b>Short-Term Effectiveness.</b> The short-term effectiveness criterion refers to an evaluation of the speed with which the remedy achieves protection. The criterion also refers to any potential adverse effects on human health and the environment during the implementation phases of the removal action.
Implementability	Implementability refers to the technical and administrative feasibility of a removal action, including the availability of materials and services needed to implement the selected solution.
Cost	The cost criterion evaluates the cost of the alternatives and includes capital, operation and maintenance, and monitoring costs.

<sup>a</sup> To provide a more comprehensive evaluation, the effectiveness criterion has been divided into several subcategories.

NOTE: 40 CFR 300(j) requires that removal actions shall, to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements ARARs. However, waivers described in 40 CFR 300.430(f)(1)(ii)(C) may be used for removal actions under the specific circumstances defined in the regulation.

ARAR = applicable or relevant and appropriate requirement

CERCLA = *Comprehensive Environmental Response, Compensation, and Recovery act of 1980*

CFR = *Code of Federal Regulations*

## 6.0 RECOMMENDED ALTERNATIVE

The recommended alternative for the facilities included in the scope of this EE/CA is D4 (Alternative 2). This alternative includes demolition of the facilities, removal of contaminated waste/demolition debris, and disposal of the material at the ERDF or another approved facility. Material that has been decontaminated or segregated as noncontaminated during implementation of the alternative would be recycled only if it economically feasible and sent to an appropriate offsite sanitary landfill or, if inert, used as fill elsewhere at the Hanford Site. The D4 alternative is recommended based on its ability to provide increased protection to human health and the environment and its effectiveness in maintaining that protection in both the short term and the long term. The alternative removes the threat to nonradiological workers who could be exposed to unacceptable levels of radioactive contaminants under future use scenarios. In addition, readiness for 300-FF-2 OU remedial actions in the geographical area would be more timely and would eliminate unnecessary costs and potential hazards associated with an extended S&M program. The estimated present-worth discounted cost of implementing the D4 alternative for the facilities included in the scope of this EE/CA is \$59.9 million, based on present-day (2005) dollars.

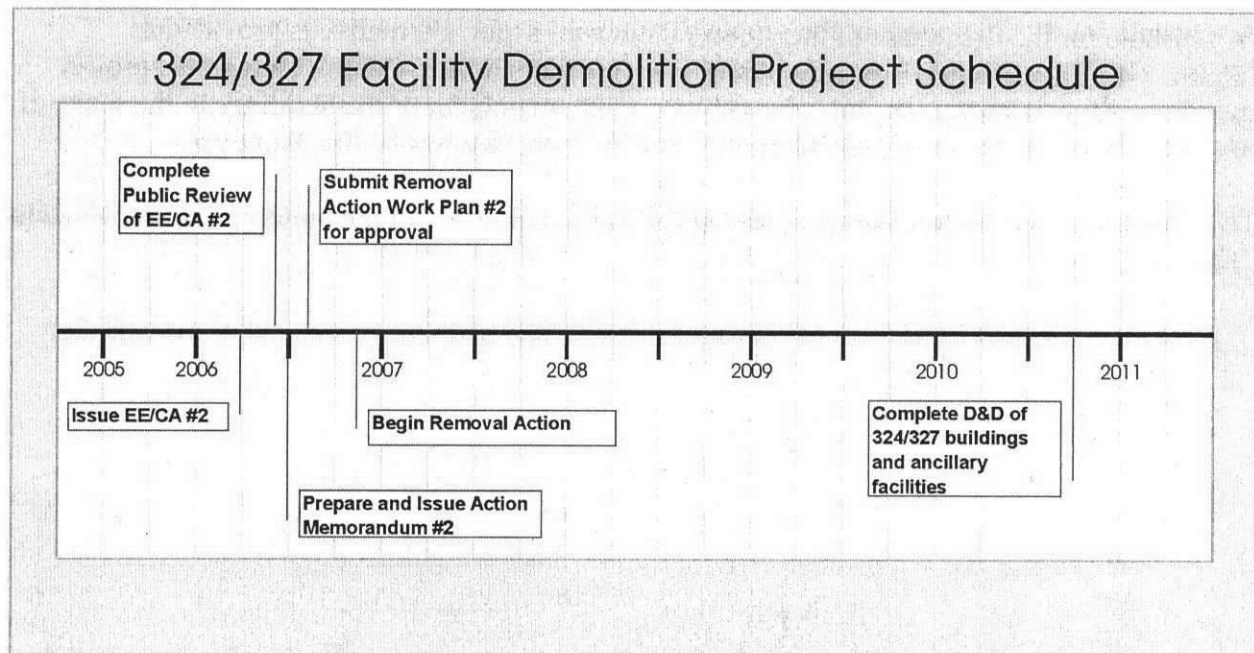


## 7.0 SCHEDULE

A schedule for the first phase of the proposed removal action alternative is provided as Figure 7-1. The schedule is based on the River Corridor Closure Contract integrated project baseline. More detailed schedules for removal of the remainder of the buildings in the scope of this EE/CA will be prepared and submitted to EPA in the removal action work plan.

The Tri-Party Agreement milestones associated with disposition of the buildings are provided in Table 1-2.

Figure 7-1. Proposed 324/327 Facilities D4 Schedule (Calendar Year).



## 8.0 REFERENCES

- 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.
- 40 CFR 1502, "Environmental Impact Statement," *Code of Federal Regulations*, as amended.
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RCW 70.105, "Hazardous Waste Management Act of 1976," *Revised Code of Washington*, as amended.

*Resource Conservation and Recovery Act of 1976 (RCRA)*, 42 U.S.C. 6901, et seq.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

**APPENDIX A**

**APPLICABLE OR RELEVANT AND  
APPROPRIATE REQUIREMENTS**



## APPENDIX A

### APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

#### A.1 INTRODUCTION

40 *Code of Federal Regulations* (CFR) 300.415(j) requires that applicable or relevant and appropriate requirements (ARARs) be met (or waived) during the course of removal actions. When environmental requirements are identified, a determination must be made as to whether those requirements are applicable or relevant and appropriate. A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the law or regulations directly address the circumstances at a site. If not applicable, a requirement may nevertheless be relevant and appropriate if (1) circumstances at the site are, based on best professional judgment, sufficiently similar to the problems or situations regulated by the requirement; and (2) the use of the requirement is well suited to the site.

To-be-considered (TBC) information is nonpromulgated advisories or guidance issued by Federal or state governments that is not legally binding and does not have the status of potential ARARs. The TBCs complement ARARs in determining what is protective at a site or how certain actions should be implemented.

A preliminary assessment has identified the following key ARARs for the alternatives being considered in this document:

- Waste management standards
- Standards controlling releases to the environment
- Environment and health radiological standards
- Cultural, historical, and ecological protection standards.

Other standards that are not environmental standards (and thus are not ARARs) but which must be met during implementation of the removal action, or that should be considered, include various U.S. Department of Energy (DOE), Federal, and state worker safety standards. Final selection of ARARs to be met during implementation of the selected removal action will be documented in the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) action memorandum.

#### A.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

A discussion of how the deactivation, decontamination, decommissioning, and demolition (D4) and surveillance and maintenance (S&M) removal action alternatives would comply with the listed preliminary ARARs is provided in the following subsections. Where pertinent to the discussion of compliance, TBC items have also been included. The no action alternative is

excluded from the discussion because it fails to meet the threshold criterion for overall protection of human health and the environment, as previously documented in Section 5.1.1 of this engineering evaluation/cost analysis (EE/CA).

### **A.2.1 Waste Management Standards**

Applicable waste management standards are identified for hazardous/dangerous waste, polychlorinated biphenyl (PCB) waste, radioactive waste, and asbestos in the following subsections.

**A.2.1.1 Hazardous/Dangerous Waste.** Subtitle C of the *Resource Conservation and Recovery Act of 1976* (RCRA), implemented via 40 CFR 260 through 279, governs the identification, treatment, storage, transportation, and disposal of hazardous waste. Authority for most of Subtitle C provisions has been delegated to the State of Washington. State dangerous waste management regulations promulgated pursuant to this delegated authority and the “Hazardous Waste Management Act of 1976” (*Revised Code of Washington* [RCW] 70.105) are codified in *Washington Administrative Code* (WAC) 173-303 and would be applicable to any dangerous wastes (under the state authority, the term “dangerous waste” is used instead of the term “hazardous waste”) that may be generated during the removal action. The regulations require identifying and appropriately managing dangerous wastes and dangerous components of mixed wastes as well as identifying associated treatment and disposal standards. Land disposal restrictions (LDRs) established under RCRA (40 CFR 268) and state regulations (WAC 173-303-140) prohibit disposal of restricted wastes unless specific concentration- or technology-based treatment standards have been met. The LDRs would be applicable to the treatment and disposal of dangerous or mixed wastes that may be generated during the removal action.

Dangerous and mixed wastes would likely be generated under both Alternatives 2 and 3. At this time, it is expected that these wastes would be primarily characteristic dangerous wastes (e.g., lead-contaminated materials). Some listed dangerous wastes (e.g., organic solvents) may also be generated. Both characteristic and listed dangerous or mixed wastes would be designated and managed in accordance with the substantive dangerous waste management standards in WAC 173-303. The LDRs would be applicable to the treatment and disposal of dangerous or mixed wastes that may be generated during the removal action. Any wastes determined to be dangerous or mixed waste would be treated as appropriate to meet the standards of 40 CFR 268 and WAC 173-303-140 before disposal. For example, lead-contaminated waste could be encapsulated.

After treatment, as appropriate, dangerous and mixed waste that meets the requirements of the *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (BHI 2002) would be disposed at the Environmental Restoration Disposal Facility (ERDF), which is authorized to receive such waste. Any dangerous waste that does not meet the ERDF waste acceptance criteria would be staged within the area of contamination or sent to a CERCLA onsite dangerous waste storage area meeting the substantive requirements of WAC 173-303, and subsequently disposed at an approved dangerous waste disposal facility. CERCLA offsite disposal (including disposal

at a Hanford facility not considered “onsite” under CERCLA) would require an offsite acceptability determination from the U.S. Environmental Protection Agency (EPA) in accordance with 40 CFR 300.440.

**A.2.1.2 Polychlorinated Biphenyl Waste.** The *Toxic Substances Control Act of 1976* (TSCA) (as implemented by 40 CFR 761) regulates the management and disposal of PCBs and PCB waste. PCB-contaminated waste would likely be generated under both Alternatives 2 and 3 and would be managed in accordance with the 40 CFR 761 requirements for PCB remediation waste. The ERDF is authorized to accept non-liquid PCB wastes for disposal. All PCB waste that meets ERDF waste acceptance criteria (BHI 2002) would be disposed at the ERDF. Any PCB waste that does not meet the ERDF waste acceptance criteria would be staged within the area of contamination or sent to an onsite PCB storage area meeting the substantive requirements of TSCA, and subsequently transported offsite to an approved TSCA waste disposal facility. Offsite disposal would require an offsite acceptability determination in accordance with 40 CFR 300.440 from EPA.

**A.2.1.3 Radioactive Waste.** Radioactive wastes are governed under the authority of the *Atomic Energy Act of 1954*. The U.S. Nuclear Regulatory Commission’s performance objectives for land disposal of low-level radioactive waste are provided in “Licensing Requirements for Land Disposal of Radioactive Waste” (10 CFR 61, Subpart C). Although not applicable to DOE facilities, these standards are relevant and appropriate to any disposal facility that would accept radioactive or mixed waste generated under this removal action. Low-level radioactive waste would be generated under both Alternatives 2 and 3 being considered for this removal action. Provided that this waste meets the acceptance criteria, it would be disposed at the ERDF, which is authorized to receive low-level waste resulting from CERCLA activities.

**A.2.1.4 Asbestos.** Multiple forms of asbestos are expected to be encountered. The removal and disposal of asbestos and asbestos-containing material (ACM) is regulated under the *Clean Air Act of 1955* (as implemented by 40 CFR 61, Subpart M). These regulations provide standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation. Handling of asbestos and/or ACM would be required for either of the removal action alternatives. Asbestos and/or ACM would be removed and disposed at the ERDF in accordance with the cited regulations, including appropriate packaging. Asbestos work will be performed in accordance with 40 CFR 61.145(a), 40 CFR 61.145(c), and 40 CFR 61.150. There could potentially be instances where the facility is structurally unsound and in danger or imminent collapse. In these cases, in accordance with 40 CFR 61.145(a)(3), only the requirements of 40 CFR 61.145(c)(4) through (c)(9) would apply. If the facility is structurally unsound and in danger of imminent collapse, EPA concurrence would be sought, as the requirements to obtain an order of a state or local government agency in accordance with 40 CFR 61.145(a)(3) is administrative.

### **A.2.2 Transportation**

The *Hazardous Materials Transportation Act of 1974* (49 U.S.C. 1801-1813), as implemented by the “U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials” (49 CFR 100 through 179), governs the transportation of potentially hazardous materials, including samples and waste. These requirements would be applicable to any wastes or contaminated samples that would be shipped from the 300 Area to the 200 Areas (i.e., to the ERDF) or shipped off the Hanford Site. Both Alternatives 2 and 3 would require transportation of contaminated waste and potentially contaminated samples. Compliance with this ARAR would be met through implementation of DOE orders and Federal procedures (e.g., DOE O 460.1A, *Packaging and Transportation Safety*).

### **A.2.3 Disposal**

The disposal requirements for the ERDF and other disposal facilities are presented in the following subsections.

**A.2.3.1 Environmental Restoration Disposal Facility.** Because both Alternatives 2 and 3 would include disposal of waste at the ERDF, ERDF waste acceptance criteria (BHI 2002) must be met. The ERDF waste acceptance criteria (which are a TBC item) define radiological, chemical, and physical characteristic criteria for disposal of waste at the facility.

**A.2.3.2 Other Disposal Facilities.** Waste generated during the implementation of either Alternative 2 or 3 that could not meet or be treated to meet the ERDF waste acceptance criteria would be stored or disposed at an alternate Washington State Department of Ecology- and EPA-approved facility. Any waste disposal occurring off the Hanford Site would require an offsite acceptability determination by EPA in accordance with 40 CFR 300.440.

### **A.2.4 Standards Controlling Releases to the Environment**

The proposed removal action alternatives have the potential to generate airborne emissions of pollutants.

The Federal *Clean Air Act* and the “Washington Clean Air Act” (RCW 70.94) regulate both criteria/toxic and radioactive airborne emissions. Implementing regulations found in 40 CFR 61.92 sets limits for emission of radionuclides from the entire facility to ambient air. Radionuclide emissions cannot exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. The definition of a facility includes all buildings, structures, and operations at one contiguous site. The Hanford Site is considered the facility for this requirement. This requirement is applicable because there is the potential to emit radionuclides to unrestricted areas from the removal action. WAC 173-480-070 requires verification of compliance with this standard.

Radioactive air emissions are to be controlled through the use of best available radionuclide control technology (WAC 246-247-040(3)). The existing 324 and 327 Building ventilation

systems, which includes final-stage, high-efficiency particulate air filtration, will be used until the systems are shut down prior to removal. Standard industrial practices will be employed to control diffuse and fugitive emissions. Both Alternatives 2 and 3 are expected to comply with this standard.

Emissions of radionuclides are to be measured for point sources (40 CFR 61.93) and for nonpoint sources (WAC 246-247-075(8)). Measurement techniques may include, but are not limited to, sampling, calculation, smears, or other reasonable method for identifying emissions as determined by the lead agency. 40 CFR 61.93(b) is applicable for measuring emissions from the 324 and 327 Building stacks. The preparation of a written quality assurance program plan is considered an administrative requirement. However, the requirement to ensure that emission measurements are representative and are of known precision and accuracy, and to respond promptly when emission measurements indicate unexpectedly large emissions, is considered applicable. As D4 progresses, the contamination levels will decline and, at such time, continuous emission and measurement activities, where applicable, will be discontinued and periodic confirmatory measurements will be performed. As the D4 activities progress, the stacks will be shut down and removed. Both Alternatives 2 and 3 are expected to comply with these standards.

Conditions and limitations for the control and monitoring of radioactive emissions from the 324 and 327 Buildings are currently incorporated into the Hanford Site Air Operating Permit (Ecology 2001). The substantive requirements from the regulations cited above will be incorporated into the removal action work plan for this removal action. The terms and conditions contained in the Washington State Department of Health License and the Hanford Site Air Operating Permit for these two facilities will be considered obsolete upon EPA approval of the removal action work plan.

WAC 173-400 and 173-460 establish requirements for emissions of criteria/toxic air pollutants. The primary source of emissions resulting from this removal action would be fugitive particulate matter. Requirements applicable to this removal action are contained in WAC 173-400-040(3) and (8). These regulations require that reasonable precautions be taken to (1) prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, demolition, or other operations; and (2) prevent fugitive dust from becoming airborne from fugitive sources of emissions. Particulate emissions would be controlled through standard industrial practices (reasonable available control technology) including, but not limited to, application of water spray, fixatives, and/or temporary confinement enclosures/glovebag containments. Both Alternatives 2 and 3 are expected to comply with these standards.

WAC 173-460 may be applicable to removal actions that require the use of a treatment technology that emits toxic air pollutants. No treatment requirements have been identified at this time that would be required to meet the substantive applicable requirements of WAC 173-460. Treatment of some waste may be required to meet the ERDF waste acceptance criteria. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques (e.g., macroencapsulation or grouting), and WAC 173-460 would not be considered an ARAR. If more aggressive treatment is required that would result in the emission of toxic air pollutants,

the substantive requirements of WAC 173-460-030, WAC 173-460-060, and WAC 173-460-070 would be evaluated to determine if the requirements are applicable.

#### **A.2.5 Stormwater Run-Off**

Stormwater run-off from some of the facilities listed in this document discharge to engineered structures (e.g., injection wells). These drains are registered pursuant to WAC 173-218. A Hanford Sitewide state discharge permit issued pursuant to WAC 173-216 addresses discharges of stormwater to engineered structures. Substantive provisions of the permit include the implementation of best management practices and meeting the groundwater quality criteria (WAC 173-200).

#### **A.2.6 Cultural, Historical, and Ecological Resource Protection Requirements**

Requirements associated with archeological remains, human remains, historical artifacts, endangered species, and migratory birds are presented in the following subsections.

**A.2.6.1 Archeological Materials.** The *Archeological and Historic Preservation Act of 1974* (16 U.S.C. 469-469c) provides for the preservation of historical and archeological data (including artifacts) that might be irreparably lost or destroyed as the result of a proposed action. The facilities within the scope of this EE/CA are located in areas that are highly disturbed from past and present industrial operations. Consequently, the likelihood of encountering archaeological materials within the footprint of these facilities would be low for either alternative. The likelihood would be greater at borrow sites from which backfill material is obtained. Awareness training would be provided to site workers. If archeological materials were discovered, a mitigation plan would be developed in consultation with the appropriate authorities.

**A.2.6.2 Human Remains.** The *Native American Graves Protection and Repatriation Act of 1990* (as implemented by 43 CFR 10) requires agencies to consult and notify culturally affiliated tribes when Native American human remains are inadvertently discovered during project activities. It is unlikely that work proposed in this EE/CA would inadvertently uncover human remains. If human remains were encountered, the procedures documented in the *Hanford Cultural Resources Management Plan* (DOE-RL 2003) would be followed.

**A.2.6.3 Historical Artifacts.** The *National Historic Preservation Act of 1966* (as implemented by 36 CFR 800) requires Federal agencies to evaluate historic properties for National Register of Historic Places eligibility and to mitigate adverse effects of Federal activities on any site eligible for listing in the Register. A programmatic agreement that was prepared by DOE specifies how activities at the Hanford Site will comply with the requirements to identify, evaluate, and treat buildings and historic archaeological remains from the Hanford era (DOE-RL 1996). The accompanying treatment plan directs the process for evaluating properties on the Hanford Site, and identifies the 324, 324A, and 327 Facilities as contributing facilities recommended for individual documentation (DOE-RL 1998). Stipulation V(C) of the programmatic agreement requires that an interior assessment be undertaken for the facilities to identify artifacts that may

have interpretive or educational value prior to deactivation, decontamination, or decommissioning activities. These walkthroughs would be scheduled prior to the commencement of removal actions. Historic items tagged during this walkthroughs will either be photographed or the items will be retrieved and transported to an appropriate curation facility as stipulated by DOE.

**A.2.6.4 Endangered Species and Migratory Birds.** The *Endangered Species Act of 1973* and WAC 232-012-297 require the conservation of critical habitat on which endangered or threatened species depend and prohibit activities that threaten the continued existence of listed species or destruction of critical habitat. The *Migratory Bird Treaty Act of 1918* makes it illegal to remove, capture, or kill any migratory bird or any part of nests or the eggs of any such birds. Within the 300 Area Complex, most of the area has been characterized as highly disturbed by industrial/waste management operations to the extent that plant communities are sparse and plants or animals on the Federal or state lists of endangered or threatened plants/wildlife are found in the 300 Area Complex. Potential impacts to biological resources would be of greater concern at borrow sites because they are located in otherwise undisturbed areas. Activity-specific ecological reviews would be conducted to identify potentially adverse impacts prior to beginning fieldwork.

### **A.3 REFERENCES**

- 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, as amended.
- 36 CFR 800, "Protection of Historic and Cultural Properties," *Code of Federal Regulations*, as amended.
- 40 CFR 61, "National Emissions Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.
- 40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*, as amended.
- 40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, as amended.
- 40 CFR 262, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, as amended.
- 40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.
- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

- 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.
- 40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities," *Code of Federal Regulations*, as amended.
- 40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.
- 40 CFR 270, "EPA-Administered Permit Programs: The Hazardous Waste Permit Program," *Code of Federal Regulations*, as amended.
- 40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs," *Code of Federal Regulations*, as amended.
- 40 CFR 272, "Approved State Hazardous Waste Management Programs," *Code of Federal Regulations*, as amended.
- 40 CFR 273, "Standards for Universal Waste Management," *Code of Federal Regulations*, as amended.
- 40 CFR 279, "Standards for the Management of Used Oil," *Code of Federal Regulations*, as amended.
- 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.
- 40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions," *Code of Federal Regulations*, as amended.
- 40 CFR 761, "Polychlorinated Biphenyls (PCBs)," *Code of Federal Regulations*, as amended.
- 43 CFR 10, "Native American Graves Protection and Repatriation Regulations," *Code of Federal Regulations*, as amended.
- 49 CFR 100 through 179, "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials," *Code of Federal Regulations*, as amended.
- Archeological and Historic Preservation Act of 1974*, 16 U.S.C. 469-469c.
- Atomic Energy Act of 1954*, 42 U.S.C. 2011, et seq.
- BHI, 2002, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, BHI-00139, Rev. 4, Bechtel Hanford, Inc., Richland Washington.

*Clean Air Act of 1955*, 42 U.S.C. 7401, et seq.

*Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*, 42 U.S.C. 9601, et seq.

DOE O 460.1A, *Packaging and Transportation Safety*, as amended, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1996, *Programmatic Agreement Among the U.S. Department of Energy, Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site*, Washington, DOE/RL-96-77, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1998, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*, DOE/RL-97-56, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2003, *Hanford Cultural Resources Management Plan*, DOE/RL-98-10, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 2001, *Hanford Air Operating Permit*, Department of Ecology Publication Number 00-05-006, Washington State Department of Ecology, Olympia, Washington

*Endangered Species Act of 1973*, 16 U.S.C. 1531, et seq.

*Hazardous Materials Transportation Act of 1974*, 49 U.S.C. 1801-1813, et seq.

*Migratory Bird Treaty Act of 1918*, 16 U.S.C. 703, et seq.

*National Historic Preservation Act of 1966*, 16 U.S.C. 470, et seq.

*Native American Graves Protection and Repatriation Act of 1990*, 25 U.S.C. 3001, et seq.

RCW 70.94, "Washington Clean Air Act," *Revised Code of Washington*, as amended.

RCW 70.105, "Hazardous Waste Management Act of 1976," *Revised Code of Washington*, as amended.

*Resource Conservation and Recovery Act of 1976 (RCRA)*, 42 U.S.C. 6901, et seq.

*Toxic Substances Control Act of 1976*, 15 U.S.C. 2601, et seq.

WAC 173-200, "Water Quality Standards for Ground Waters of the State of Washington," *Washington Administrative Code*, as amended

WAC 173-216, "State Waste Discharge Permit Program," *Washington Administrative Code*, as amended

WAC 173-218, "Underground Injection Control Program," *Washington Administrative Code*, as amended

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," *Washington Administrative Code*, as amended.

WAC 232-012-297, "Endangered, Threatened, and Sensitive Wildlife Species Classification," *Washington Administrative Code*, as amended.

WAC 246-247, "Radiation Protection -- Air Emissions," *Washington Administrative Code*, as amended.

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